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Roads five years old that are almost as good as new—

When roads come through more than five years of service in as fine condition as the one illustrated herewith, which was built in 1913, you begin to appreciate the truth of the statement, made so often in connection with Tarvia, namely:

That while the original cost of a tarvia-macadam road is a little more than an ordinary water-bound macadam road, the tarvia-macadam is much *cheaper in the end* because of its long service and very low maintenance costs.

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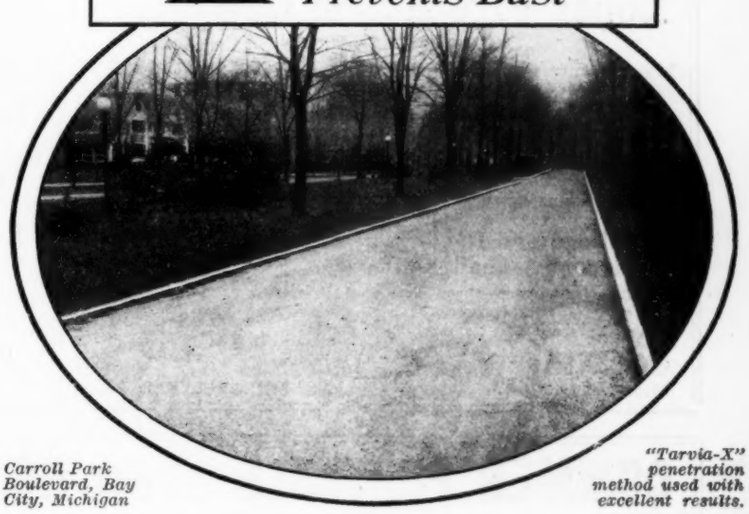

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at this time extend these utiliies to the limit of their ability in so far as they will aid the "own your home" movement. This furnishes an additional argument why cities should go ahead promptly with extensions and improvements that have been delayed during the war or that will aid in bringing back normal business and labor conditions.

The department makes another suggestion also, which is that cities insure the permanency of value of the new homes and of the conditions surrounding them by adopting and enforcing restrictions for such areas which will prevent their being invaded by buildings or industries of a kind which experience has shown have almost invariably depreciated the value of residential property.

REPORT ON DETROIT WATERWORKS

Filter Plant Operated for Twelve Months—Demonstrates Possibility of Filtering Detroit's Water at Very High Rate—As Demonstration Plant It Educates the Public—Plans for Permanent Plant.

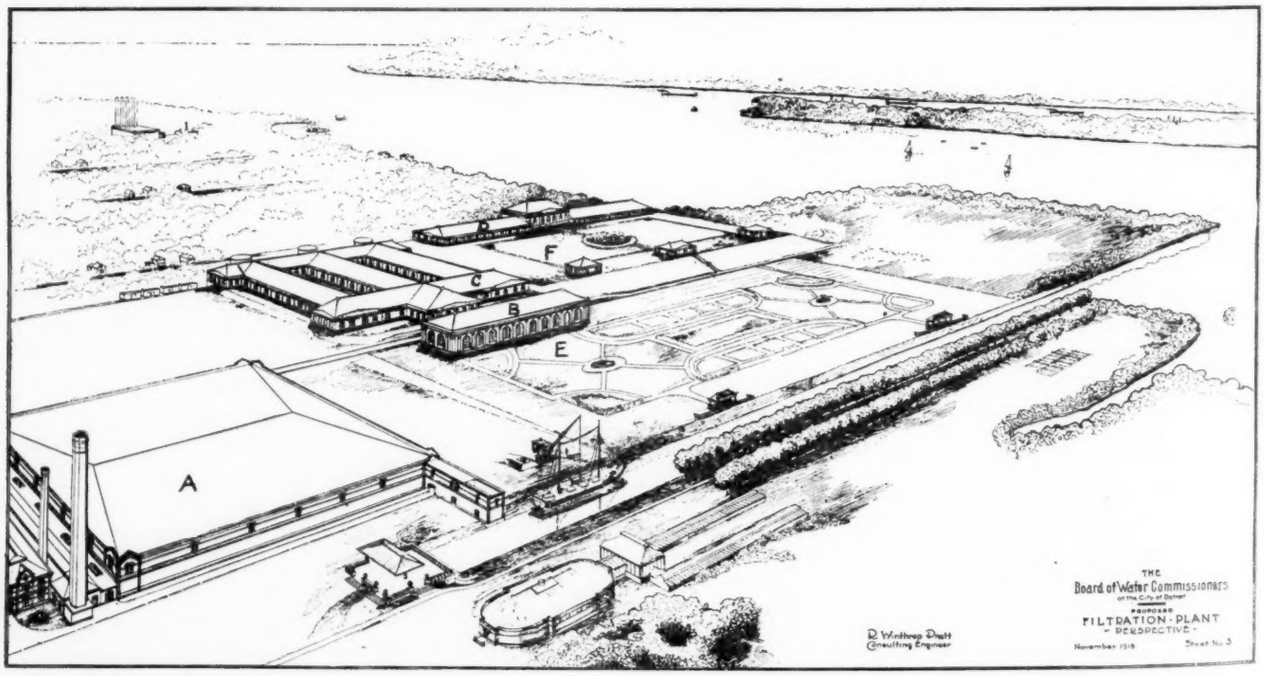
In the fall of 1917, the Board of Water Commissioners, of Detroit, Mich., engaged R. Winthrop Pratt to investigate and report upon the improvements desirable in certain features of the water supply of that city. Mr. Pratt's report was made in March of this year, the interval of a year and a half having been devoted largely to the construction and operation of an experimental filtration plant, which it was thought desirable to run for a continuous period of twelve months.

Perhaps the feature of this report most interesting to other cities and waterworks officials is the demonstration of the value of a special investigation by means of an experimental plant in determining the possibilities of filtering the particular water in question. According to Mr. Pratt's conclusions from the operation of this experimental plant, it has demonstrated that the rate of filtration of Detroit's water can be made considerably higher than ordinary standard practice, which means that a considerable sum can be saved in the construction of the plant. As is stated in the report: "It is interesting to note that all the largest cities now having filtration plants, before adopting any plan, made careful tests on the respective local waters in order to be sure that the plan adopted would meet all requirements. Among such cities are the following: Philadelphia, St. Louis, Cleveland, Pittsburgh, Cincinnati, Washington, Louisville, Providence, Columbus, New Orleans and Harrisburg. Milwaukee is now conducting experiments.

"In other words, none of the large cities mentioned has simply copied the design of a plant which has been successful in some other place, but each has worked out the best design, or at least has tested out local waters by means of experimental studies and the operation of small temporary plants."

Another interesting feature of this investigation was the recognition of the importance of favorably influencing public opinion with respect to filtration. "The educational value of an experimental filter plant is a very important one. The majority of citizens, although desiring to have clear water, have had little or no opportunity for investigating or understanding the methods by which such water may be secured. The plant, therefore, was designed so that the process by which the water was treated could be easily understood by all visitors."

"It was originally intended that the experimental filter should be open to the public in order that the citizens might see the process and become informed as to the possibilities of filtration. The closing of the park on

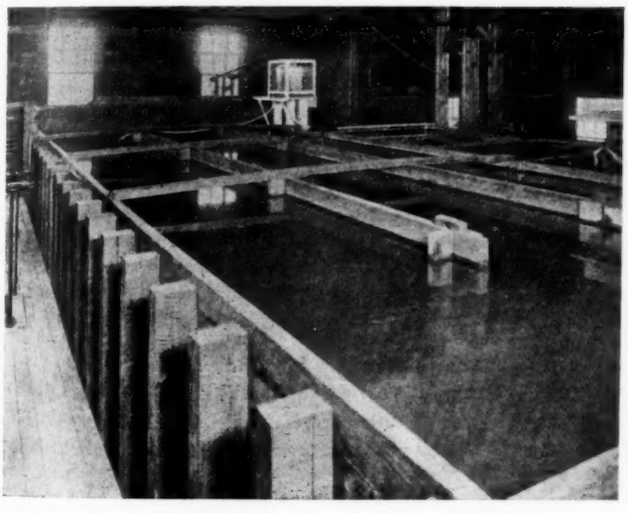


GENERAL PERSPECTIVE OF PROPOSED FILTRATION PLANT IN WATER WORKS PARK.
A—Existing old pumping station. B—Low-lift pumping station. C—Filter building. D—Mixing chambers. E—Filtered water reservoir. F—Coagulation basin.

account of the war, however, prevented the carrying out of this idea." As a practicable but less satisfactory substitute, the water was piped to a booth erected at the entrance to the waterworks park, where it was discharged into a plate-glass tank, where its transparency could be observed, and also was given to such citizens as might desire it, being removed by them in bottles or other hand-carried containers. This booth was described in Municipal Journal for July 13, 1918.

PROBLEMS INVESTIGATED.

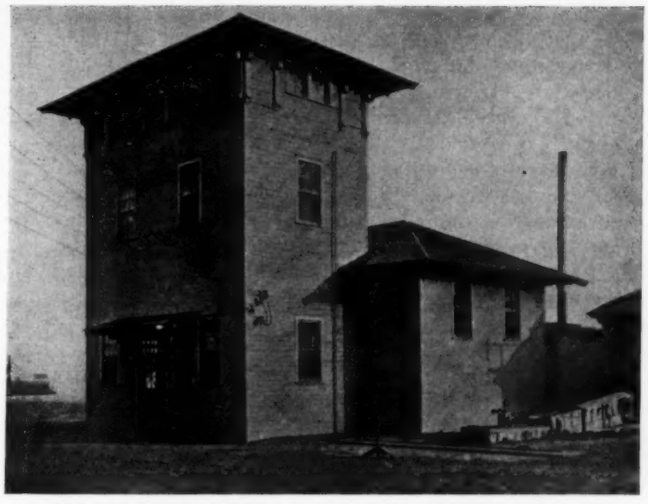
The city's supply is drawn from the Detroit river through an intake ten feet in diameter, which terminates in an intake crib 3160 feet from the shore shaft of the intake tunnel. The river is of course more or less polluted, but the typhoid rate has not been high considering this fact. Disinfection of the entire supply began early in 1913, bleaching powder having been used at first, later replaced with liquid chlorine. Perhaps the weightiest argument with the public in favor of filtration was the turbidity of the water at certain times, although waterworks experts and physicians realized the greater importance of eliminating danger of water-borne diseases. It was thought possible that both of these ends might be obtained by taking the water from Lake St.



INTERIOR OF EXPERIMENTAL FILTRATION PLANT.
Coagulation basin in foreground, mixing chambers in left background, filters in right background.

Clair or Lake Huron, but Mr. Pratt shows that the cost of extending the intake to either of these lakes would be considerably greater than that of filtration, while the result would be a water much less desirable from either bacteriological or turbidity standpoint. There was of course no question but that the water could be filtered satisfactorily, and it was therefore decided that filtration was to be preferred to drawing the supply from either of these lakes.

Mr. Pratt also reports that he sees no reason for thinking it desirable to change the location of the present intake. There was, however, another difficulty in this connection, which was included in his investigation and report, this being the fact that the older of the pumps now in use were set at such an elevation that at low water the suction required is so great that they are not able to draw full capacity through the intake tunnel. Two methods were suggested for meeting this difficulty, one being to lower the pumps, the other to raise the water by auxiliary low-lift pumps which would operate during low water and pump into the suction well of the high-lift pumps in question. This was a matter which called for immediate attention, and was, perhaps, the first to



EXPERIMENTAL FILTRATION PLANT BUILDING.

be definitely decided upon. In view of the probability that a filtration plant would be installed near the pumping station within a few years, and that low-lift pumps would be required for raising the water to the elevation of such plant, it was decided to install these pumps under a design which would permit their being used temporarily for feeding the suction well as just described, and later be adopted for permanent use in connection with the filtration plant. Bids for this pumping equipment were received in November, 1918, and the contract for them was awarded this spring.

The desirability of softening the water was considered. The hardness of the Detroit water is about 85 parts per million, and was rarely complained of by native residents, being much less than that of other cities in the middle west, Toledo's water, for instance, having a hardness of 200 parts per million and that of Dayton 350 parts. It was calculated that the theoretical financial gain due to saving in soap would be no greater than the cost of softening the water, and therefore it was decided to at least postpone the construction of a plant for softening the water until more important improvements had been put into service.

CONCLUSIONS FROM FILTRATION EXPERIMENTS.

As a result of the twelve months' operation of the experimental filtration plant, the following conclusions were drawn:

1. The river water drawn through the present intake can be easily and satisfactorily purified by the process of rapid sand filtration. Its quality is well within the most severe standards fixed by sanitary authorities for a filterable water.

2. It is feasible to use higher rates of filtration than has been the practice generally in the middle west heretofore. This results in a decrease in the required area of filters and hence in a saving in the expense of constructing a filtration plant.

3. That instead of three or four hours sedimentation period, as has been the more general practice, less than a two hours' period will be ample, thereby making another large saving in construction cost.

4. That the use of a filter sand having an effective size of approximately 0.50 m.m. gives just as good results as the use of a finer sand and results in a large saving of wash water.

5. That while sulphate of iron as a coagulant used in connection with lime gave good results, the use of this material with the local water required more careful supervision. The handling of two kinds of material instead of one makes for additional labor charges and increased construction costs.

6. That a filtration plant of sufficient capacity to filter all the water that can be drawn through the present intake can be constructed on the present water works property.

The plant for supplying the city would have a capacity of about 300,000,000 gallons a day and would be larger than any single plant of the rapid sand type that has yet been built. Because of the comparatively low turbidity of the water, it seemed probable that it could be filtered at a higher rate than is usually employed and that coalugation basins as well as filters could be materially reduced in size. The chief object of the plant, therefore, aside from educating the public, was to determine the maximum rate of filtration that could be used, the necessary amount of preliminary sedimentation, and the most suitable kinds and amount of coagulant.

THE EXPERIMENTAL PLANT.

The experimental plant was operated continuously from October 1, 1917, to September 30, 1918. It had a capacity of approximately 200,000 gallons a day. It conmprised a mixing chamber, coagulation basin, two filter units, and a filtered-water basin, together with the necessary wash-water tank and coagulant mixing, storage and controlling devices. The plant was housed in a neat frame building shown in the accompanying illustration, located near the shore shaft of the ten-foot intake tunnel. Two 2-inch motor-driven centrifugal pumps raised the water from this tunnel directly into the mixing chamber, at the entrance to which the coagulant solution, flowing by gravity from orifice boxes on the floor above, was mixed with the raw water. The water thus treated flowed through the mixing chamber at a velocity of 0.66 foot per second, the chamber being divided by two longitudinal baffle walls so as to compel the water to flow three times its length, or thirty feet in all. The mixed water then entered the coagulation basin, which was twenty-five feet long and divided into three parallel channels, giving a flow of 75 feet and a retention period of one hour and forty-seven minutes and a velocity of flow of 0.71 foot per minute.

Each of the two filter units was four feet by six and about ten deep. The effective size of the sand in the east filter during most of the time was 0.40 m.m. and that of the west filter was 0.53 m.m. A wash-water storage tank of 2,500 gallons capacity was located in the third story of the building. The filters were designed to be washed at a high rate, using no air or other auxiliary means of agitation, but depending entirely upon the upward velocity of the wash-water through the bed of sand. It was found possible to use a rate of wash as high as 30.5 inches per minute without carrying away any of the filter sand.

Samples of raw, settled and filtered water were collected four times a day and tested for turbidity, alkalinity and bacteria, a total of 15,000 samples having been examined. The operating conditions were changed from time to time in order to obtain data for use in determining the most favorable procedure as regards time of mixings, period of sedimentation, rate of filtration, kind and amount of coagulant, rate of washing, and effective size of sand. The maximum turbidity of the raw water observed during the year of operation was 490 parts per million. At all times the effluent from the experimental filter was free from turbidity. Alum was used as a coagulant during the greater part of the test, the amount used varying from 0.41 grain per gallon to 0.91. Iron and lime were used for a part of six months, the amounts varying from 0.42 grains of iron and 0.65 grains of lime per gallon to 0.95 grains of iron and 1.14 grains of lime.

The number of bacteria was determined by making counts on gelatine plates incubated at 20 degrees and on agar plates at 20 degrees and 37 degrees centigrade. An average of the entire test gives, from gelatine test, 244 bacteria in raw water, 150 in settled water, and 50 and 55 in effluent form the east and west filters respectively. The 20 degree agar test gives the total bacteria as 417 in raw water, 269 in settled water, and 108 and 106 in the two filters; while the 37 degree agar gives 37 in raw, 27 in settled and six in each of the filter effluents. To determine the presence of B.coli, the so-called "partially confirmed test" was used. From these the following conclusions were drawn: B.coli in one c.c. of water was found 42 times in 648 samples of raw water, 28 times in 654 samples of settled water, no times in 968 samples of east filter effluent and twice in 804 samples of west filter effluent. In 10 c.c. of water, B. coli was found 257 times in 650 samples of raw water, 226 times in 654 samples of settled water, 113 times in 970 samples of east filter effluent, and 97 times in 805 samples of west filter effluent.

The average rate of application of wash-water to the east filter was 25 inches vertical rise per minute, and 30.5 inches for the west filter which contained the coarser sand. During the last month of the experiment, the rate of wash water to the west filter was reduced to 25 inches with no appreciable change in bacterial efficiency. The west filter was more easily operated than the east, the loss of head increased more evenly and washing was accomplished more satisfactorily. The coarser sand offered no more difficulty than the finer in permitting small amounts of flock to pass through the sand.

The rate of filtration was varied from a minimum of 157,000,000 gallons per acre per day to a maximum of 207,000,000 gallons. The number of bacteria in the effluent was lower with a rate of between 196,000,000 and 202,000,000 gallons than it was at any lower rates. The 207,000,000 gallon rate was used during a time when the number of bacteria in the raw water was greatest, and as a result the number in the filter effluent was also greatest during this time, but the percentage reduction of bacteria was twice as great as the average for the entire experiment.

Although the use of iron and lime as a coagulant was not continued for as long a time as was alum, it was given a thorough trial. The best results were obtained while using about 0.75 grain per gallon of iron and 0.55 of lime, or 107 pounds and 79 pounds respectively per million gallons. Based on normal prices, the cost of the alum delivered at the plant would be about the same as that of the iron and lime.

"Many cities use the iron and lime process because of the high temporary hardness of the raw water which they are obliged to treat, which hardness is reduced by the use of lime. However, the temporary hardness of the Detroit river does not warrant the use of lime for this purpose.

"It was found that the iron and lime process required more and closer attention to the plant to secure good results than did the alum process producing equally good or better results. Some trouble was experienced from clogging lime orifices, and the handling of even the small amount of lime required for the test plant created much objectionable dust.

"The handling of lime in large quantities is unpleasant work, requiring the use of masks by those employed in unloading it from the cars, and the installation of dust-proof mechanical transporting devices. The use of lime and iron would also require double sets of storage, mixing and solution tanks. To obtain the best results in lime slaking, considerable hot water is desirable. The labor charge would also be greater than when alum alone is used. With these facts in mind we have made our plans and estimates for a filtration plant with the

idea of using alum as a coagulant, believing it will be more satisfactory."

The construction of the mixing chamber and its location afforded an excellent opportunity to observe the process of mixing and the formation of flock. It was found that at the end of five minutes the flock was easily distinguishable and that at the end of ten minutes an excellent coagulation resulted, the flock increasing in size as it passed through the coagulation basin.

The filters were successfully operated for several weeks with less than one hour of sedimentation. There was an average removal of suspended matter of about 63 per cent while passing through the coagulation basin.

DESIGN OF PLANT.

The plan of the plant, designed to filter the entire supply of the city, provides for locating it on land directly in the rear of the present pumping station, which appeared to have only one objectionable feature, viz. that the soil is soft and wet and that all the structures will require pile foundations. It is proposed to use concrete piles in order to avoid possibility of the tops of the piles failing if they should not always be wet, and for greater convenience in anchoring the structures to the piles to overcome any tendency to floatation by the semi-fluid character of the surrounding material.

The capacity is based on an average consumption of 150 gallons per capita and a population of about 1,425,000, which is that anticipated by the year 1930. The site permits increasing the capacity by more than 50 per cent when this may become necessary. The rate of filtration assumed is 175,000,000 gallons per day per acre, although it is suggested that the filters can be used at a rate about 10 per cent higher if necessary.

There are two mixing chambers, each with a capacity of two million gallons, a retention period of thirteen minutes and a velocity of flow of 1.4 feet per second. There are six coagulation basins, each with a capacity of 4.35 million gallons, a retention period of two hours and a velocity of flow of three feet per minute. The sludge from the coagulation basins will be discharged through a drain to the river. Alum is to be used as a coagulant.

Each mixing chamber is 182 feet long by 68 feet wide. Alum is brought by rail to the east end of the coagulant house and raised by a conveyor to the storage bins. Dry alum is drawn from the bottom of these bins to conveyors, which carry it to weighing devices, which discharge it into the dissolving tank.

Each coagulation basin is 363 feet long by 103 feet wide, with the water 16 feet deep. Water pipes, carrying water under city pressure, will be built into the basins with connections for attaching fire hose for aid in cleaning the basins.

There are planned to be seventy-two rapid sand filters, each having an area of 1,286.8 square feet, or a sand area of 1,000 square feet. This gives a nominal capacity of each unit of four million gallons a day. The depth of filter gravel is 18 inches and of filter sand 30 inches, the effective size of the sand to be between 45 and 50 m.m. Water from elevated wash-water tanks will be applied at the rate of 25 to 30 inches of vertical rise per minute.

The filtered water reservoir has a capacity of 36,000,000 gallons. The plant provides for low-lift pumps with a total capacity of 365,000,000 gallons a day, a maximum suction lift of 7.7 feet and a maximum discharge head of 25.9 feet.

The estimate of cost is based on present prices, and it is suggested as possible that, before bids are received, there may be a considerable reduction in the prices of most of the materials. The total cost for all structures and superstructures, including outside pipe lines, and with ten per cent added for engineering and contingencies, is estimated at $5,868,000. The operating cost, based on a daily average pumpage of 250,000,000 gallons with one per cent used for wash-water, is estimated to be $145,700 per year for low-lift pumping, or $1.60 per million gallons pumped. The cost of operating the filtration plant is estimated at $187,625 per year or $2.06 per million gallons filtered; giving a total cost of pumping and filtration, corrected for the use of wash-water, of $3.69 per million gallons. Adding fixed charges based on 5 per cent thirty-year bonds gives a total cost of $7.91 per million gallons. When the plant is first put in operation and the average daily demand probably will not exceed 200,000,000 gallons, the unit charges are estimated to be $9.42 per million gallons.

SEWAGE DISPOSAL AT COLUMBUS

Some Features of Report for 1918—Purification Not Sufficient Under Summer Conditions—Tank Foaming—Filter Flies.

The issue of the City Bulletin (the official publication of the city of Columbus, Ohio) for April 26th contains the annual report of Jerry O'Shaughnessy, superintendent, and C. B. Hoover, chemist in charge, of the sewage disposal plant of that city.

Mr. O'Shaughnessy calls attention to the fact that the pollution of the Scioto river above the outlet of the disposal plant is so great that the addition of the disposal plant effluent produces an unsatisfactory condition, and urges that the state authorities eliminate the conditions that produce such pollution. Even with the practical elimination of other pollution, however, that of the sewage effluent would remain more serious than any of the others, since the average daily discharge of treated sewage is twenty million gallons, while the flow of the river reaches a minimum of five million gallons.

The figures given in the report show that for normal stages, and even for low stages of the river, when the water temperature is low, the treatment which the sewage receives is adequate to prevent exaustion of oxygen in the stream; but when the temperature is high, even with normal stages the treatment is insufficient if the period be protracted, and with high temperature and low stages, the oxygen in the stream is completely exhausted.

Comparing the stability values of the river, we find that above the works to be 74, seven miles below it is 73, eleven miles below it is 91, and reaches 100 at 16.3 miles. The stability value of the final effluent of the plant was only 31, which certainly would seem to be lower than good practice would call for under the condition of such a small degree of dilution.

The oxygen-consumed value of the river water above the plant averaged 8.7 parts per million, while seven miles below it this had fallen to 7.7; showing that, in spite of the addition of the sewage effluent, there was an improvement in this respect in seven miles of flow. In the next four miles the oxygen-consumed value fell to an average of 3.8.

Owing to the increase in the amount of sewage treated, which was about 12 per cent greater than in 1917 and about 70 per cent greater than in 1916, the average detention period in the tanks has fallen from 4 or 5 hours, which was the period from four to six years ago, to 2.8 hours. The total suspended solids removed by the tanks last year was only 37 per cent, as compared to the 40 to 60 per cent of from two to five years ago; while the

plant as a whole average 50 per cent removal of suspended solids as compared to 60 to 80 per cent a few years ago. Attention is called, however, to the fact that only 54 per cent of the weight of the total suspended solids were settleable, and that the tanks removed 69 per cent of such settleable solids. "The proportion of settleable to total suspended solids in the Columbus sewage we believe to be unusually low and that the subsidence of the solids of the sewage is unfavorably affected by long travel in the sewers and by action of the centrifugal pumps."

"Our experience with two-story tanks indicates that foaming is directly related to the need for sludge removable. The capacity of our sludge disposal facilities is just about adequate for a long, dry season. But if rains are at all frequent or any other condition obtains which interferes with the regular and continuous removal of wet and dry sludge, the successful operation of the tanks is very difficult."

The average cost of sludge removal was as follows:

	Per cubic yard Cents.
Labor	40.5
Gasoline	2.1
All other	1.2
Total	43.8

The labor amounted to 0.912 hours per cubic yard, and the mean labor cost per hour was 44.4 cents. The total number of cubic yards removed was 3241.3, and the average approximate length of haul was 750 feet.

On the sprinkling filters there were more flies this year than at any time during the previous three years. Also there was more unloading from the filters this year than at any time during the previous three years, which unloading lowered the percentage removal of total suspended solids. The settleable suspended matter in the filter effluent ran 1.53 c.c. per liter as compared with 1.08 c.c. in the tank effluent.

The sewage disposal plant represents bond issues totaling $1,550,000, on which there is an annual payment for interest and sinking fund of $94,115. A large part of the sewage needs to be pumped, and in 1918 this pumping cost $33,512. The sewage treatment cost $8,824, administration, $2,218, and night soil disposal cost $2,050; giving the total operating costs of $46,604. Adding the interest and sinking fund charges gives a total of $140,719. The amount of sewage pumped and treated was 4,570 million gallons, and the population was estimated at 226,000. This gave the total average cost of treatment, including pumping, $30.79 per million gallons; and the cost per capita per year 62¼ cents.

GOVERNMENT MACHINERY FOR STATE HIGHWAYS.

Under the federal road act amendments passed last winter, the Secretary of War was authorized to transfer to the Secretary of Agriculture, "all available war material, equipment and supplies not needed for the purpose of the War Department, but suitable for use in the improvement of highways"; these to be distributed among the highway departments of the several states, to be used on roads constructed in whole or in part by federal aid, on the same basis as the allotment of funds.

Some idea of the amount of equipment to be distributed may be gained from the fact that Wisconsin is to receive five hundred motor trucks, and a number of steam shovels, graders, tractors, trailers, ditchers, horses and mules, harness, explosives, tents, kitchen equipment and other contractors' supplies. Utah is to receive thirty trucks, four tractors, trailers, eight pavement mixers, four concrete mixers, twelve mess equipments, ten thousand feet of 2½ in. and 3 in. pipe, air compressor for drills, four steam shovels, twelve transits, twelve levels, etc.

The trucks to be distributed are said to include 6,000 2-ton trucks, and 5,000 two-ton quadruple drive, 8,100 3-ton trucks and 900 5-ton; of which 11,000 are entirely new.

The distribution of equipment costing more than one hundred million dollars should be of considerable assistance to the states and, combined with the reduction of 10 per cent in freight rates on road materials announced last month, should stimulate immediate and energetic beginning of state highway construction.

OKMULGEE'S WATER SUPPLY AND SEWERAGE.

Increasing Capacity and Purity of Water Supply—Constructing Sewage Treatment Plant and Reconstructing Sewerage System.

The city of Okmulgee, Okla., obtained preliminary plans for new and complete water and sewerage systems in the spring of 1917, and after submitting them to the United States Public Health Service, which recommended some changes, the proposition of issuing bonds for the construction of the work was submitted to the people and defeated. During the summer of 1918 additional engineering advice was secured and a new and more complete set of plans and specifications prepared, and in the latter part of September the issuing of bonds for construction upon the basis of these new plans was approved. Contracts were let shortly after for a sewage treatment plant and changes in the sewerage system and for reconstruction and rehabalitation of the waterworks, which work is now under construction and progressing very satisfactorily. The city is growing very rapidly, having something over one hundred new houses now under construction and the officials are already taking steps toward a new bond issue of $200,000 for further extensions and improvements. The plans under which construction is progressing were prepared by Burns & McDonnell as engineers.

Original Waterworks.—The original water supply system comprised an impounding reservoir formed by building a low dam across the Deep Fork of the Canadian river, two miles west of the city, which reservoir has a capacity of about 68,000,000 gallons; low-lift pumps which raise water from this reservoir into two settling basins, each with a capacity of about two million gallons; and high-duty pumps which force the settled water through a line of ten-inch pipe to a distributing reservoir located within the city; and, of course, a distribution system. The two settling basins at the river were used alternately and coagulating chemicals were added without any scientific control as to quantity. At the distributing reservoir, the water was treated with hypochlorite of lime fed by means of an orifice box. No bacteriological examinations were made of the water after treatment with hypochlorite and the efficiency of the treatment was doubtful. Moreover, during droughts the quantity of water available was insufficient for the increased population of the city.

Original Sewerage System.—The original sewerage system was built as a combined system, but without any general plan embracing the entire city; the result of which is that some mains are already too small for the areas served and others are laid at such elevation that new districts cannot be drained into them. The sewage is discharged untreated into the same stream from which the water supply is drawn, but below the waterworks

reservoir and about three miles from the center of the city.

NEW WATERWORKS SYSTEM.

The improvements to the waterworks system include raising the dam four feet and thus increasing the storage to 128,000,000 gallons, constructing an intake well in the reservoir, changing the low service pumping station and the piping connected therewith and the sedimentation basins, constructing a chemical house which will contain solution tanks, feed devices, mixing channels, etc., constructing an entirely new mechanical filter plant with about 4,000,000 gallons capacity and a clear well beneath the filters, and constructing an entirely new pump and boiler house and installing machinery therein, and finally laying a new 18-inch force main from the pumping station to the city.

Purification will be much more complete and scientific under the new plan. Baffles are being placed in one of the old sedimentation basins, which will give a twelve-hour period of sedimentation on the basis of 4,000,000 gallons consumption. As the water enters this basin, it is aerated by spraying it into the air and allowing it to trickle down over a series of platforms or steps. From the sedimentation basin the water passes through the chemical house, where coagulating chemicals are added, and then through duplicate mixing channels into duplicate settling basins, which were formed by reconstruction of the second of the old sedimentation basins. Each of these latter settling basins will have a capacity of about one million gallons.

The settled water will be filtered in a plant of four units, each with a capacity of one million gallons per day, equipped with hydraulically operated valves, rate controllers, loss-of-head gauges, automatic measurinig and recording devices and operating tables. The filters will contain 30 inches of sand with an effective size between 0.36 m.m. and 0.46 m.m. and a uniformity coefficient of not more than 1.65; this sand being supported on a 15-inch layer of graded gravel varying in size from one inch to about one-eight of an inch. These filters are being constructed by the Pittsburgh Filter Company.

The chemical house is equipped with dry-feed machines, solution tanks and measuring devices and will be so constructed and equipped that lime and iron, alum, or soda ash can be added as the coagulating chemicals. The plans include a space for a laboratory and the specifications call for a small amount of laboratory equipment for chemical examinations of raw and filtered water.

Effluent from the filters will be disinfected with liquid chlorine before passing into the clear-water reservoir, which has a capacity of 120,000 gallons or slightly less than one hour's supply. From the clear-water reservoir, water is pumped directly to the city without any further storage.

The new waterworks plant is being built around the old one, the latter being maintained continuously in operation at all times.

The cost of the work has been considerable, but it is not believed to be excessive considering the present high cost of labor and materials. The raising of the dam, constructing the intake well, pumping station and filter house, rebuilding the settling basin, etc., is costing $135,200; the filter equipment $46,200; one 3½ million-gallon direct-acting triple expansion pumping engine, with two boiler-feed pumps and two 150 H. P. water tube boilers, $33,400; a 48-inch by 100-foot chimney, $2,880. One 100 kva. engine generator set and switchboard cost $9,400. Miscellaneous installation work totals $25,400. Cast iron pipe and castings, fire hydrants, valves, etc., and the hauling and laying of the same totaled $134,637.

NEW SEWERAGE SYSTEM.

In improving the sewerage system, new mains will be laid which will take the sewage from existing districts on the separate system, and others which will serve districts as yet unsewered. An outfall sewer will be constructed to a point about one and a half miles south of the city, where the city has purchased about six and a half acres of land and where treatment works are under construction. The effluent from this plant will be discharged into the old outfall sewer and through it into the river as before. The changes in and additions to the sewerage system are estimated to cost $65,756 and the sewage treatment works to cost $69,000.

At the treatment plant the sewage first enters a screen chamber and pump pit, the topography requiring the raising of the sewage about twenty feet in order to carry it through the treatment plant by gravity. The screens consist of bar screens with three-quarter-inch openings. The sewage is lifted by three electrically driven centrifugal pumps, each with a capacity of 500 gallons a minute, operated automatically by floats in the pump pit.

After screening and pumping, the sewage passes into Imhoff tanks, from these to a dosing tank and thence to sprinkling filters. Two sludge beds are provided for receiving the sludge from the Imhoff tanks. The plant is so laid out as to provide space for duplicating the Imhoff tank installation and also that of the sprinkling filters.

The original surface of the ground is about elevation 51, the Imhoff tanks reach a maximum depth of elevation 41 and the walls extend to elevation 65.86, while the sewage level is three feet below this. The dosing tank is set to discharge when the Imhoff effluent reaches elevation 62.61, the water falling in this tank to elevation 57.61. The top of the stone in the sprinkling filters is 54.61, thus giving a head varying between eight and three feet for operating the sprinklers. The bottom of the sprinkling filter is about elevation 48. It appears from these figures that the Imhoff tanks, although about twenty-five feet deep, require only ten feet of excavation, and that the bottom of the sprinkling filter is only three feet below the original ground surface. The material excavated will be used in banking around these elevated structures.

The Imhoff tanks are two in number, each tank containing two settling apartments. The combined capacity of the four settling compartments is 97,000 gallons, thus allowing a detention period of three hours when both tanks are in operation. The tanks are formed with the customary hopper bottoms, each tank containing four hoppers and having a total length of 72 feet and a width of 17½ feet. There is a continuous gas vent two feet wide between the two settling channels, and another continuous vent twelve inches wide between each settling channel and the outside wall of the tank. This furnishes an area of gas vent nearly one-fourth of the entire area of the tank. The sludge pipes are vertical for a height of about twelve feet, where the horizontal sludge pipe branches off, the vertical sludge pipes being continued vertically through the gas vents to the top of the tank for cleaning-out purposes. The slopes of the hopper bottoms are approximately one to one and those of the settling chambers one to one and a half. Provision is made by channels and stop-boards for reversing the flow through the tanks. The sewage enters and leaves the tanks over weirs thirty inches wide, of which there are four at each end, both sets of weirs being protected by baffles for retaining the scum.

There are two sludge beds, each eighty feet by forty feet and containing six inches of filter sand, under-

drained by six to twelve inches of gravel. The floor of each bed slopes toward five lines of six-inch underdrains, which discharge into a main eight-inch collector across one end of the bed. The total area of the sludge beds is 6,400 square feet, thus allowing two and a half persons per square foot of surface.

The sprinkling filter now being constructed is 148 feet by 103 feet in total area. The sprinkler heads are set checker-board fashion, nine feet apart. They are fastened to the tops of three-inch galvanized iron risers which are fed by eight-inch lateral distributors, the latter being imbedded in concrete a few inches above the bottom of the filter basin. The eight-inch lateral distributors are in turn supplied through a 24-inch main distributor. The drains terminate at their upper ends in vent chambers, from which chambers rise eight-inch sewer pipe vents with elbows at their upper ends. The main underdrain is constructed with 15-inch split sewer pipe, and the lateral drains consist of 6-inch split tile laid with half-inch open joints in parallel lines ten inches between centers. Inspection manholes are placed at each end of the main drains and at the upper ends of the tile drains.

Broken stone varying in size from three-quarters of an inch to two and a half inches will be used as filtering material, the depth of the stone varying from five to six feet.

This plant is designed to treat 750,000 gallons a day, measurements of the sewage from the city indicating that it now averages 500,000 gallons, with a maximum of 700,000 and a minimum of 200,000.

BRICK PAVEMENTS

Conditions of Some Pavements in the Middle West and Conclusions Drawn by Engineers of the Bureau of Public Roads.

Two engineers of the Bureau of Public Roads, A. T. Goldbeck, engineer of tests, and F. H. Jackson, assistant testing engineer, a short time ago made an inspection of a large number of brick roads in the middle western states, and their report on the facts learned and conclusions drawn have recently been made public by the bureau. The inspection extended over city streets and county highways in the states of Ohio, Indiana, Illinois, Iowa, Missouri and Nebraska.

"One of the outstanding results was the remarkable state of preservation of roads that had been under traffic for from twenty to twenty-five years." Most of the older pavements in Cleveland were laid on a natural soil foundation, which consists mainly of fine sandy loam. Most of these are in good condition and such longitudinal cracks as have formed are probably the result of poor drainage. It was stated that about 75 per cent of the brick streets of this city are laid on natural soil foundation. A number of brick streets laid about 1900 were examined and were found in very good condition with one exception. The use of a poor grade of brick on one street, although laid on a six-inch concrete base with a two-inch sand cushion, resulted in pockets varying in size from less than a square foot to one or two square yards. One very old sand-filled pavement made with building-size brick was in splendid condition after about twenty-five years, showing no appreciable wear except that the edges of the brick were somewhat worn and rounded.

On the Cleveland-Akron road, the greatest number of failures were found on a section which had been laid on a rolled slag base, probably due to the overloading of the base by traffic at a time when the earth foundation was saturated with water. On the Cuyahoga county roads the outstanding features noted were the large number of longitudinal cracks (presumed to be due to the moisture-retentive soil), and also the typical failures due to the sand cushion working up into the joints during construction, resulting in imperfect grouting.

Of the brick streets in Conneaut, Ohio, Main street was of peculiar interest because of the fact that it was laid about twenty-five years ago and has been continuously subjected to a considerable amount of traffic. In this city a failure was being uncovered which was found to be due to the fact that, when constructing the concrete base, this had been left sloping at the end of a day's work instead of with a vertical face, and expansion had caused the adjacent section of concrete base to slide up over this sloping face, of course carrying the brick up with it, the moving section having risen about two inches higher than the other. A semi-monolithic pavement was found to have heaved three inches in the center, causing a wide longitudinal crack, while there was very little vertical movement at the sides, these facts having been determined by actual leveling. This was believed to be due to the fact that uncompacted snow at the sides of the road prevented the penetration of frost to as great a depth there as at the center. The city engineer, to confirm this theory, determined the frost penetration and found it to be greater at the center of the pavement than at the sides.

Near Sterling, Ill., was found a road 16 feet wide constructed on a gravel base with a one-inch cement-sand cushion and four-inch wire-cut lug brick, laid in the summer of 1917. There is moderate traffic with occasional heavy loads. The surface was in excellent condition, with no indications of settling of the brick. There were some transverse cracks, but no longitudinal ones. The subgrade is a fine black loam and there was no tile drainage.

A number of other interesting features were observed in the various sections visited, such as the movement of pavements away from the curb on the inside of curves, the relative condition of asphalt and cement joints in the same street, conditions of pavement with sand cushion, cement-sand and monolithic, methods of laying brick in passing around curves, etc.

IMPORTANCE OF SUBGRADE.

The authors give a number of conclusions which they have drawn as a result of their observations and investigations, and among these is the important part that the subgrade or soil plays in the life and wear of a pavement. They concluded that it plays a very important part in the formation of longitudinal cracks, and that it is very important that a thorough study be made of the underlying soil and the drainage conditions before attempting to design a road for a particular locality. A thorough study of capillarity and the methods of draining various kinds of soils they believe to be essential to improvement in pavement construction. The nature of the subgrade should be considered in designing the base, since it is perfectly obvious that the character of the subsoil which supports the foundation and the character of the loading transmitted through the wearing course to the foundation are the two important factors in designing the base. A subgrade which is very soft, such as a clay saturated with moisture, would require a much thicker base than one which is always exceedingly firm and unyielding. At the present time the exact distribution of the reaction against the under side of a concrete base or slab is unknown and

will have to be determined by suitable tests. At present, therefore, the proper thickness of the base must be based on precedent.

THICKNESS OF BASE.

It would seem from the results of observations that the present-day heavy traffic can be carried safely on a four-inch concrete base with a four-inch brick wearing course when monolithic construction is used and the subgrade conditions are favorable; but that the thickness of the base be increased along any stretch where subbase conditions are open to question. On every heavily traveled city street, also, the concrete base should be thicker. When sand cushion construction is used with grouted brick surface, a six-inch concrete base should give good results under heavy traffic, with an increase in thickness over soft spots in the subgrade. If a bituminous filler is used in the brick wearing surface, theoretically the concrete base should be thicker than in the case of a grouted surface, but in the absence of test data it is impossible to state how much thicker.

The authors express their disapproval of bricks without lugs in that it is much more difficult to obtain joint spacing of sufficient and uniform width to permit of good grouting. The bar lugs which are commonly found in vertical fibre bricks too greatly reduce the area of cement in joints, in their opinion. The wire-cut-lug brick they report to have gained greatly in popularity since they were first introduced, one advantage being the square edge as compared with the rounded edge of repressed brick, and another being the roughness of the joint face which facilitates the adhering of jointing material.

JOINT FILLERS.

Concerning the use of bituminous and of cement fillers, the writers make the following remarks:

Although there is considerable opposition to the general use of bituminous fillers for brick pavements, good results in using asphalt have been obtained in certain cities west of the Mississippi as has been previously noted. The principal disadvantage of bituminous fillers appeared to be the lack of protection afforded the brick at the joints; moreover they do not give any slab strength to the brick surface. The former fact was noted in a number of cases on old bituminous filled streets in which the edges of the brick have worn badly. The relative action of traffic on bituminous filled and grout filled joints was noted on those streets where expansion joints consisting of a number of courses of bituminous filled brick had been installed. The difference in wear was very noticeable.

Another disadvantage of bituminous fillers is the tendency, particularly noted in tars, of running out at the sides of the road in hot weather or chipping in cold weather. They possess still another disadvantage of requiring constant attention at the time of application to insure that the temperature of the bituminous material remains at the proper point; since, if too cold, they will bridge the joints instead of penetrating, and, if too hot, they will become hard and inert. On the other hand, they possess the undoubted advantage of being free from expansion troubles. They likewise make a somewhat quieter pavement.

The ease of making service cuts in city streets through this type of pavement is another advantage.

It should be emphasized that when a bituminous filler is used particular care should be taken in its selection in order to avoid the troubles incident to ill-suited materials. In those asphalt filled streets examined in the cities west of the Mississippi, it was noted that by the use of considerable excess of bituminous material a wearing mat of appreciable thickness was formed over the surface of the brick pavement. This mat apparently remains for some years, depending upon its thickness and the character and volume of traffic, and while still intact undoubtedly protects the brick from the action of traffic to a very large extent. This probably is the reason brick streets in this section have worn so little.

CONCLUSIONS.

The authors have drawn the following conclusions as a result of their study of brick pavements:

1. The type and thickness of base for any brick pavement should depend upon (a) the maximum weight of the loads to be carried, and (b) the bearing value, under all weather conditions, of the underlying soil.

2. In all cases where the traffic to be carried is likely to be heavy or where the underlying soil is of such a nature that its bearing value is not sufficient to support the pavement under all conditions, a concrete base of sufficient thickness to properly distribute the loads should be provided.

3. Where the maximum weight of the loads to be carried is not excessive and the subsoil is of a porous well-drained nature, the thickness of the concrete base may be decreased or, under very favorable conditions, it may even be omitted altogether.

4. Other things being equal a somewhat lighter construction may be permitted in the case of the "monolithic" and "semimonolithic" types than where the ordinary sand cushion type is provided, on account of the increased slab strength which these types appear to possess.

5. A concrete curb or edging is not necessary when "monolithic' 'or "semimonolithic" construction is used.

6. Paving brick with well-formed contact lugs are to be preferred to brick without lugs.

7. Paving brick with square edges are to be preferred to brick with rounded edges.

8. Given the requisite care in construction, satisfactory results may be obtained with either cement grout or bituminous filler.

9. Vertical fiber lug brick with bituminous filler have given good service in those cities west of the Mississippi where they were inspected, possibly due to the protecting action of the asphalt mat which prevents wear from coming upon the brick direct.

10. Expansion joints in grout filled pavements would seem advisable at street intersections and at points of tangency on curves, and longitudinal points should be used against all rigid curbs or structures.

MIAMI FLOOD CONTROL WORKS.

Investigations made by the engineering staff of the Miami Conservancy District include a number of subjects that are of general interest to engineers, and the plans for the flood control work form an important chapter in the development of that branch of engineering. The district has published six reports describing the development of the project and features and investigations of importance, and has six others in preparation. These are sold at 50 cents to $1.50 each, and are well worth the price, containing from 111 to 310 pages of most instructive matter.

The reports include one giving the story of the Miami Valley flood, another describing the control projects, another giving the contract forms and specifications, with detail drawings; while others give the results of investigations of "Hydraulic Jump and Backwater Curves," "Calculation of Flow in Open Channels," and "Storm Rainfall of the Eastern United States." Reports in preparation cover hydraulic and structural design of the protection system, laws, appraising benefits, construction plants, etc. These reports can be obtained from the Miami Conservancy District, Dayton, O.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading ones published in other countries, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current litnamed after each article, except that wh ance of this we will furnish any of the ar ticles listed 'n the index for the price erature on muncipal matters. In further issues of the paper, the price given is for ere an article is continued in two or three each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its given, and the name of the author when contents is added. The length also is it is a contributed article.

ROADS AND STREETS.

Highway Finances:

Financing Highway Improvements. Life of a loan should be that of the road; payment by annual appropriations; parties interested in road financing. Report to American Road Builders' Ass'n by committee of which Nelson P. Lewis is chairman. 2,100 words. Municipal Journal and Public Works, Apr. 19. 10 cts. 3,200 words. Good Roads, Apr. 26. 10 cts.

Hundreds of Millions for Roads. Amount limited almost entirely by what can be done and not by the money needed to pay for it. 150 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

The Present Level of Prices, with Special Reference to Prices of Road-Making Materials. Suspicion of prices; views of an eminent economist who believes prices are on new and permanently higher level. Address at Conference of Governors and Mayors at Washington, by S. M. Williams, pres. Highways Industries Ass'n, Washington, D. C. 2,600 words. Municipal and County Engineering, April. 25 cts.

Why Illinois Shows Wisdom in Not Waiting for Road Material Prices to Decline. Substantial reduction not tc be expected this year; preferable to provide jobs for idle men than to wait for problematical reduction. 700 words. Engineering and Contracting, Apr. 16. 15 cts.

Cost Keeping for Highway Contractors. Suggestions for making daily estimates of unit costs; daily overhead; installing and shifting plant. Paper before American Road Builders' Ass'n, by H. P. Gillette. 2,800 words. Good Roads, Apr. 19. 10 cts.

Highway Work Contemplated for 1919. Nearly $400,000,000 already available, and more than $100,000,000 assured for road work this year. 2,000 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Contracts and Labor:

What Kind of Contracts? Editorial discussion of vital question; lump sum method most commonly used, but has obvious weaknesses; cost-plus contract indorsed by Brig. Gen. Marshall, chief of construction division of War Dept. 800 words. Good Roads, Apr. 19. 10 cts.

Comparison of Long and Short Highway Contracts. Opportunity for both: outgrown methods should be discarded; long contracts cheaper and desirable to attract large construction organizations. By H. Eltinge Breed, first deputy commissioner of highways, N. Y. S. 1 ill., 3,200 words. Engineering News-Record, Apr. 24. 20 cts.

Unit Price and Cost-Plus Systems of Contracts for Public Work. Our old friend, "liquidated damages"; how should damages be computed; must not censor expenditures. By A. W. Graham, from paper before the Chicago Road Congress. 2,000 words. Canadian Engineer, Apr. 10. 15 cts. Engineering and Contracting, Apr. 2. 15 cts.

Efficient Methods of Contracting for Highway Work During the Reconstruction Period. Brief outline of methods of contracting that have heretofore prevailed; no method that will apparently offer improvement upon lump sum form of bid. By John H. Gordon, pres., New York State Road Builders' Ass'n, paper presented at convention of the American Road Builders' Ass'n. 1,400 words. Good Roads. Apr. 5. 10 cts.

Ohio Uses Cost-Plus-Lump-Sum Contract for Highway Maintenance. Schedule of bids on contract for road reconstruction. 500 words. Engineering News-Record, Apr. 10. 20 cts.

Piecework Faster Than Day Labor on Hand Excavation. Greater yardage per man recorded in California on both road and irrigation work; station gangs used on piecework. By Everett N. Bryan, chief engr., Waterford Irrigation District, Waterford, Calif. 800 words. Engineering News-Record, Apr. 10. 20 cts.

Day Labor, Force Account and Bonus System in Highway Work. Concensus of opinion of great number of highway engineers that day-labor system has become unpopular and has the name of being costly without the advantages claimed by the contract system. By Chas. M. Upham, chief engr., Delaware State Highway Dept., from paper before Chicago Road Congress. 2,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Labor Efficiency Good on Percentage Contracts. Carefully kept figures on peace-time construction contradict common charge against this form of contract; inefficient laborers rather than type of contract cause of trouble on war construction. By H. C. Turner, pres., Turner Construction Co., N. Y. 3,700 words. Engineering News-Record, Apr. 24. 20 cts.

Convict Labor on Highway Work. Extracts from a report at the American Road Builders' Ass'n by a committee of which G. P. Coleman, Virginia state highway commissioner, is chairman, summarizing the practice of various states in the use of convict labor on highway construction. 1,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Convict Labor on State Highway in California. Interesting information given in first biennial report of the California Highway Comn. 4 ills., 3,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Designing and Theory:

The Importance of Adequate Drainage and Foundation for Road and Street Surfaces. Points to be given consideration are travel and traffic to be carried, character of subsoil, drainage (natural or artificial), climate, location and material available. By Clifford Richardson, engr., The Barber Asphalt Paving Co., Woolworth bldg., N. Y. C. 5,000 words. Municipal and County Engineering, April, 25 cts.

The Alignment of Roman Roads. Giving the author's idea of the method followed by the Romans in aligning their roads. Letter by Reginald Wellbye to The Surveyor of Oct. 4, 1918. 600 words. Engineering and Contracting, Apr. 30. 15 cts.

Construction of Highways in Cuts. Modification of the ordinary treatment being adopted more or less widely where hard surface pavements are used; most striking feature the elimination of shoulders and gutters. 1 ill., 300 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Provincial Highway Surveys. Three commendable methods of procedure briefly outlined; careful inspection necessary; location of centre line; trial line sometimes necessary; reading and recording angles. By John T. Ransom, surveyor, dept. of public highways, Ontario. 5,000 words. Canadian Engineer, Apr. 10. Canadian Engineer, Apr. 17. 15 cts.

Elimination of Dangerous Road Junction and Its Cost. Deep rock cut and fill improve conditions; traffic maintained by sectional building; special drainage system installed. By Eugene Gedney, Nyack, N. Y. 3 ills., 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Considerations Affecting Design of Heavy Traffic Highways in Ontario. Motor traffic leads to stronger highways; thickness of road crust; shearing forces. By W. A. McLean, deputy minister of highways, Toronto, Ont. 2,000 words. Municipal and County Engineering, April. 25 cts.

Road Design and Regulation of Traffic. Discussion of principles to be considered before any rational progress can be made; past experience of little value under present conditions. By H. J. Fixmer, paving engr., board of local improvements, Chicago. 2 ills., 4,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Regulating Truck Weights and Sizes. Editorial comment on the bill agreed on by the Pennsylvania state administration and Motor Federation. 200 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Damage to Road Surfaces by Heavy Vehicles. Principal causes to which damage can be ascribed. From The Engineers, Feb. 21. 1,500 words. Engineering and Contracting, Apr. 30. 15 cts.

Maintenance:

Road Maintenance in Rural Areas. Use of refuse destructor clinkers in road work; effect of climatic conditions on road surfaces; tarring surfaces of constructed roads. From Journal Institution of Municipal and County Engineers, by James A. Webb. 1,400 words. Engineering and Contracting, Apr. 30. 15 cts.

Maintenance Data on Twenty-eight Sections of Test Road. Accurate records kept by Philadelphia show relative cost for various types; traffic census of roads. 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Maintain Earth Roads by Patrol Contracts in Kansas. State highway department has general supervision but lacks power of initiation; machinery counteracts labor shortage. 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Special Motor Equipment Used on Road Maintenance. North Carolina highway department has combination truck and tractor to plow, drag and transport materials and men. By D. H. Winslow, state maintenance engr., Raleigh, N. C. 3 ills., 800 words. Engineering News-Record, Apr. 17. 20 cts.

Army Work:

Military Roads as Constructed and Projected by the Construction Division, War Department, U. S. A., in 1918. Materials of construction; cost plus contracts commended; costs; abstracts from "Instruction to Constructing Quartermasters." 2 ills., 2,000 words. Municipal and County Engineering, April. 25 cts.

23rd Engineers Being Held to Repair French Roads. Gen. Pershing carrying out policy insisted on by French government; Gen. Black urges patriotic acceptance of situation. By Wingrove Bathon, Washington representative of Engineering News-Record. 2,300 words. Engineering News-Record, Apr. 24. 20 cts.

Road Building at Army Camps. Summary of work of the construction division of War Department in 1918. By Daniel B. Goodsell, highway engr., construction division, U. S. War Department. 3 ills., 3,000 words. Good Roads, Apr. 12. 10 cts.

National Highways:

National Roads. Argument in their favor based on success of national administration of French roads; necessary for interstate routes. By Maj. E. A. Kingsley, engr., U. S. A. 2,200 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

A National Highway as a National Monument of Peace. Republication of an article which appeared in this journal in May, 1917, urging the building of a transcontinental highway across Canada as a memorial to our soldiers. By the editor. 1,600 words. Canadian Municipal Journal, April. 20 cts.

National Highways. Benefits of a national highway system; political or spiritual and military benefits; extent and administration of system. Committee report at American Road Builders' Ass'n. Edward J. Mehren, chairman. 2,300 words. Good Roads, Apr. 19. 10 cts.

Brick Paving:

Developments in Brick Paving. Construction with sand cushions, cement mortar beds, and green concrete foundation. By Maj. Wm. M. Acheson, paper before American Road Builders' Ass'n. 2,800 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Present Status of Brick Pavements Constructed with Sand Cushions, Cement Mortar Beds and Green Concrete Foundations. By Maj. W. M. Acheson, div. engr., N. Y. State Commission of highways, paper presented at the convention of the American Road Builders' Ass'n. 2,800 words. **Good Roads, Apr. 5. 10 cts.**

The Construction of Modern Brick Pavements. The relative value of sand cushions, cement mortar beds and green concrete foundations. By Maj. W. M. Acheson, div. engr., N. Y. State Commission of Highways. 3 ills., 2,000 words. American City, April. 35 cts.

Present Status of Brick Pavement Construction. Advantages and disadvantages of old and new methods; description of three different types. By Maj. Wm. M. Acheson, div. engr., N. Y. State Highway Comn., paper before convention of American Road Builders' Ass'n. 2,200 words. Engineering and Contracting, Apr. 2. 15 cts.

Concrete Pavements:

Machine Finishing Concrete Roads. Three methods of reducing voids in concrete; effect of excess water; mechanical compacting of concrete; conrete road finishing mahine. By E. G. Carr, Lakewood Engrg. Co., Cleveland, O. 5 ills., 1,500 words. Municipal and County Engineering, April. 25 cts.

Reinforcing System and Concreting Machine for Reinforced Concrete Roads. Two features of interest in connection with concrete road construction by the Port of London, designed by J. H. Walker of the Port Authority. Description abstracted from Concrete and Constructional Engineering. 2 ills., 500 words. Engineering and Contracting, Apr. 30. 15 cts.

Tamped Concrete Specified for Illinois Roads. Requirements controlling quality of workmanship made more rigid; increase in machine operations encouraged. 800 words. Engineering News-Record, Apr. 10. 20 cts.

Concrete Pavements for Mountain Roads. Instructions issued in 1917 by the California Highway Commission to its division engineers giving tentative sections for concrete pavements on mountain highways. 1 ill., 600 words. Engineering and Contracting, Apr. 2. 15 cts.

Other Pavements:

Road-Oil Heating Plant of Los Angeles County. Road department builds plant from old equipment in stock; installation saves county $20 per 1,000-gallon tank. By E. Earl Glass, Monrovia, Calif. 3 ills., 1,600 words. Engineering News-Record, Apr. 10. 20 cts.

Cement-Concrete Base Proportions for Bituminous Pavements. One of three methods suggested: a richer concrete base, a thicker concrete base, a richer and thicker concrete base; 1:3:6 concrete generally accepted standard. By W. L. Hemplemann, engr., Asphalt Sales Dept., The Texas Co. 600 words. Canadian Engineer, Apr. 24. 15 cts.

Some Specific Suggestions on the Design and Construction of Modern Wood Block Pavements. Pavement base; pitch coat; treatment of creosoted wood block; advantages of lug block. By E. A. Fisher, city engr., Lakewood, O. 4 ills., 1,700 words. Municipal and County Engineering, April. 25 cts.

Improvements of the Embarcadero in San Francisco. Bituminous concrete strip and wide basalt block pavement provide for light and heavy vehicles on waterfront thoroughfare. By Chas. W. Geiger. 3 ills., 500 words. Good Roads, Apr. 19. 10 cts.

Hay-Tar Roads in Wisconsin. Experimental road in Wisconsin after 12 months of service; commission does not recommend this type where it is possible to obtain local clay or gravel. 1 ill., 500 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Street Details:

Saving Shade Trees. Comparisons between efforts made by the Street Maintenance Department of Los Angeles to save shade trees, and refusal of Iowa City to spare line of full-grown trees because of requirements of ordinance. 150 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

The Classification and Census of City Trees. Methods of readily recording condition of trees. By Albert F. W. Vick. 2 ills., 1,000 words. American City, April. 35 cts.

Buried Streets of San Francisco. Part of the city extends into a country of sand dunes, the continuous shifting and irresistible progression of which is one of the most serious problems the city has to face. 2 ills., 300 words. Municipal Journal **and Public Works,** Apr. 5. 10 cts.

The Michigan Avenue Improvement. Is the most important addition to Chicago's boulevard system. By Hugh E. Young, engr. of bridge design, Chicago. 7 ills., 3,500 words. Engineering World, Apr. 15. 15 cts.

Set-Back Lines in Newton. Edwin H. Rogers, city engineer of Newton, Mass., in his annual report, makes brief mention of policy adopted in 1917. 300 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

General Problems and Aspects of Grade Separation. Extracts from a report by the Division of Grade Separation and Bridges, of Detroit, Mich.; grade separation and city planning; grade separation by depression or elevation of street. 4,000 words. Engineering and Contracting, Apr. 16. 15 cts.

Avoiding Duplicate Street Names. Newton, Mass., has 367 duplications of names; resolution passed relative to naming new and renaming old streets in honor of residents who lost their lives in the war. 200 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Miscellaneous:

The Future of Highway Transportation. Editorial discussion of what it will mean five or ten years from now; little doubt in short-haul work; long-haul business will depend upon relation of costs; responsibility of highway engineers. 1,100 words. Good Roads, Apr. 12. 15 cts.

Good Roads Propaganda by Government "Movies." Visual instruction section of the Department of the Interior to distribute slides and films of American and foreign road work. 500 words. Good Roads, Apr. 12. 10 cts.

The Highways of the Future. The "imaginative" road, or a dream of what our roads will be in 10 or 20 years from now; the "speculative" road, or what we estimate they will be based on past experience. From paper before the Joint Highway Congress, Chicago, by H. G. Shirley, secy., Highway Industries Ass'n. 2,400 words. Engineering and Contracting, Apr. 2. 15 cts.

Tabulated Highway Data: Facts and Figures Furnished by County Highway Officials Especially for This Issue. Bridge failures; county work; results of heavy traffic; pavement guarantees; contract work. 10 pages tables. Municipal Journal and Public Works, Apr. 19. **10 cts.**

Earth-Moving Methods and Equipment for Road Construction. Hand shovels, barrows and carts; cost of grading with slush-scrapers; method of grading with road-grader or road scraper. From paper before meeting of County Road Superintendents and Engineers of Ontario, by A. R. McVicar, 1,100 words. Engineering and Contracting, Apr. 2. 15 cts.

Core Drilling Outfit for Test Specimens from Pavements. Employed by the testing division of the California Highway Commission for securing test samples from finished pavements. 2 ills., 400 words. Engineering and Contracting, Apr. 2. 15 cts.

To Supervise Federal Aid Road Work. Thomas H. MacDonald appointed by Secretary of Agriculture for this work; now chief engineer of Iowa State Highway Commission. 150 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Snow Fences. Brief description and illustration of snow fence on Lincoln highway constructed by the State Highway Department of Pennsylvania. 1 ill., 250 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

SEWERAGE AND SANITATION.

Sewer Construction:

Equipment and Methods Employed in Building Sewers in San Francisco, Cal. Sewage discharged only at points where there are strong tidal currents; great deal of the work done on busy streets, involving handling flow of existing sewers. By H. W. Shimer, ass't city engr., San Francisco. 18 ills., 2,700 words. Municipal and County Engineering, April. 25 cts.

Construction of Long Outfall Sewer Under Unusual Conditions. Description of construction at Columbia, S. C., by city force under direction of city engineer, by which $35,000 was saved. By T. Keith Legaré, city engr. 4 ills., 900 words. American City, April. 35 cts.

Drains in Sewer Construction. Use of drains as method of removing ground water from trenches during construction of sewers has been developed in San Francisco with some details a little out of the ordinary. 2 ills., 300 words. Municipal Journal and Public Works, Apr. 2. 10 cts.

Segment Blocks Have Advantages on Larger-Size Drains. Lightness, ease of handling, and small breakage are a few of the desirable characteristics; trouble with unstable soils. By D. L. Yarnell, senior drainage engr., Bureau of Public Roads and Rural Engrg. 1,300 words. Engineering News-Record, Apr. 3. 20 cts.

The Columbia Outfall Sewer. The South Carolina city constructs its own installation; built partly on concrete trestles and partly through solid rock; work done cheaper than if performed under contract. By T. Keith Legaré, asso. mem. A. S. C. E., city engr., Columbia, S. C. 3 ills., 900 words. Fire and Water Engineering, Apr. 2. 15 cts.

Sewage Treatment:

The Disposal of Sewage by Treatment with Acid. The Miles Acid Process. Paper presented Jan. 22 by Edgar S. Dorr and Rob. Spurr Weston, of Boston, Mass., followed by discussion. 11,000 words. Journal of the Boston Society of Civil Engineers, April. 50 cts.

Design Features of Sewage Disposal Plant at Industrial Housing Development of the Alan Wood Iron and Steel Co., at Swedeland, Pa. By Geo. L. Robinson, consulting engr., 37-39 E. 28th St., N. Y. C. 1 ill., 900 words. Municipal and County Engineering, April. 25 cts.

Use of Sludge as a Fertilizer. Efforts, experiments and results obtained in disposing of sludge produced at the works of which the author is in charge. By F. T. Hambleton, from the Surveyor, Dec. 20. 1,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Grit Chamber and Fine Screens for Part of New York Sewage. First plant to treat sewage from Manhattan borough; eductors clean grit chambers; two 14-foot Riensch-Wurl screens. By Chas. E. Gregory, engr. of drainage and sewage disposal, Manhattan, N. Y. C. 3 ills., 1,200 words. Engineering News-Record, Apr. 3. 20 cts.

Chlorination of Sewage. Tests at New Haven on crude sewage, screened sewage, and the effluents from Imhoff and activated effluent. 1,500 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Chlorination of Sewage. Tests at New Haven on crude and screened sewage and the effluents from Imhoff tank and activated sludge process. From Municipal Journal and Public Works. 800 words. Canadian Engineer, Apr. 24. 15 cts.

Sewage Disposal by Dilution, Including Chlorination of Sewage Effluent and Treatment of Sludge. Analyses of crude sewage after passing through grit chambers and tank effluent after chlorination; effect of sewage effluent upon river water. By W. C. Easdale, from The Surveyor, Mar. 21. 2 ills., 4,500 words. Engineering and Contracting, Apr. 30. 15 cts.

Sanitation:

Typhoid in the Large Cities of the United States in 1918. Continued downward trend in majority of cities of more than 100,000 population; eight cities under 3 per 100,000. 1,000 words. Engineering News-Record, Apr. 24. 20 cts.

Malaria Control at Nitrate Plant. Mosquito eradication by clearing, drainage and oiling water surfaces reduces

disease 95% in Alabama district. By W. G. Stromquist, sanitary engr., U. S. Public Health Service, Florence, Ala. 5 ills., 1,400 words. Engineering News-Record, Apr. 10. 20 cts.

Army-Trained Health Officers for Cities. Medical department includes medical and non-medical men well trained for positions of public health. By A. W. Hedrich, editor, American Journal of Public Health. 500 words. American City, April. 35 cts.

Pollution of Boundary Waters. Report of the International Jont Commission formed to investigate this matter; elaborate reports issued, prepared by experts; United States suggested and Canadian Government concurred in asking for recommendations. 1,600 words. Fire and Water Engineering, Apr. 2. 15 cts.

Miscellaneous:

Milwaukee Sewage Pumping Station. Description of new automatically controlled system; disposal plant for treating a daily flow of 130 million gallons of sewage; three pumps with 30 million gallons capacity each. By T. Chalkely Hattan, chief engr. sewage commission. 3 ills., 600 words. Fire and Water Engineering, Apr. 23. 15 cts.

Testing a New Flush Tank. Description of experiments conducted by W. T. Knowlton, engr. of sewers, Los Angeles. 2 ills., 1,000 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Cast-Iron, Wrought-Iron and Steel Pipe for House Drainage Purposes. Findings and conclusions reached in an investigation of relative life, deterioration by corrosion, and other characteristics of pipe materials used in main drainage, soil and vent system of buildings. By Paul Gerhard, D. Engr., C.E., consulting engr., New York, abstracted from Journal of Franklin Institute. 8 ills., 2,500 words. Engineering World, Apr. 1. 15 cts.

Municipal Aid for Private Plumbing. Two recommendations intended to aid the poorer property owners in observing laws for proper sanitation in their buildings, are contained in the report for 1918 of the Division of Health of Toledo, O. 400 words. Municipal Journal and Public Works. Apr. 5. 10 cts.

Los Angeles Sewerage. Operation of Imhoff tanks and other types of sewage treatment plans, purchasing sewer pipes, measuring sewage flow, testing flush tanks and general sewer maintenance. 1,300 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Santa Rosa's Sewerage and Water Supply. Each dwelling allowed 10,000 gallons of water a month free of charge; sewage disposed of at a sewage farm, containing an incinerator; expense of operation and receipts. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Newton Sewerage Notes. Entire sewage of Newton, Mass., discharges into the outfall sewer of the Metropolitan Water and Sewerage Board. 400 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Unique Features of Unified Operation of Water, Sewerage and Drainage Facilities at New Orleans, La. Many innovations and improvements over usual methods and procedure. 3 ills., 10,500 words. By Geo. G. Earl, gen. supt., Sewerage & Water Board, New Orleans. Municipal and County Engineering, April. 25 cts.

Day Labor on a Large Scale. Constructing 2-million dollar sewage treatment plant with municipal employes in Indianapolis. 100 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

WATER SUPPLY.

Pumping:

Cost of Pumping Through Pipe Lines. Table of cost per mile per million gallons of pumping water at various rates through different sizes of cast-iron pipe lines. By G. C. Habermeyer, state water survey division, Urbana, Ill. 1 table, 1,000 words. Fire and Water Engineering, Apr. 24. 15 cts.

The Wills Pumping System. Particularly adapted to water works of small cities and towns; first successfully installed in Memphis; forces water directly into mains from wells. 1 ill., 500 words. Fire and Water Engineering, Apr. 16. 15 cts.

Deep Well Pumps at El Paso. Water obtained from 44 wells averaging 600 feet deep except two of 900 feet; total production obtainable 10 million gallons a day; all operated by air-lift. 600 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Vergennes Pumping Station. Description of the Vermont city's power development; new power house and dam built, and new pumping outfit installed; old machinery held as a reserve unit; distribution system practically a closed one. By H. W. Taylor, engr., N. Y. C. 4 ills., 1,200 words. Fire and Water Engineering, Apr. 30. 15 cts.

The Hydraulic Ram. Its possibilities for small town installations apparently not appreciated by engineers; descriptions of some important installations. 2 ills., 2,000 words. Fire and Water Engineering, Apr. 16. 15 cts.

Design of New Electric-Drive Water-Pumping Station was Governed by Power Rate. Current charge for 3 months depends on maximum use in any 2-hour period; universal meter system postponed because temporarily cheaper to pump more water, but expected to come later. By Henry W. Taylor, consulting engineer, N. Y. C. 2 ills., 2,500 words. Engineering News-Record, Apr. 3. 20 cts.

Variable Power Sources Add to Dependability of Water Supply. Manchester consistently improves waterworks. By R. W. Fracker, engr., Waterworks, Manchester, N. H. 600 words. American City, April. 35 cts.

Waste Prevention:

Prevention of Water Waste and Reasons for Metering in Large Western City. Extracts from pamphlet supplied each customer by the Spring Valley Water Co. of San Francisco in introducing new system of charges. 1,400 words. Canadian Engineer, Apr. 24. 15 cts.

Devices for Water-Waste Surveys at Oak Park, Ill. Portable Venturi meter to test pipe districts; pitometer inserted in house service makes leakage charts. 3 ills., 1,100 words. Engineering News-Record, Apr. 24. 20 cts.

Baths, Pressure and Pipes Influence Effect of Water Meters. Three factors noted by H. P. Matte, chief sanitary engineer of Illinois State Department of Public Health in paper before Western Society of Engineers. 500 words. Engineering News-Record, Apr. 17. 20 cts.

Compound Meters. Not on the approved list in New York City, but advisability of their use in saving revenue on large installations has been considered. By Fred B. Nelson, dept. of water supply, gas and electricity, N. Y. C. 1,000 words. Canadian Engineer, Apr. 3. 15 cts.

Water Consumption Cut More Than Half at Newark, O. Contract for water-waste survey reduced underground leakage and located illegal use of water. By F. H. Waring, ass't engr., Ohio State Dept. of Health, Columbus, O. 1,500 words. Engineering News-Record, Apr. 10. 20 cts.

Prevention of Water Waste and Reasons for Metering. Extracts from pamphlet supplied each customer by the Spring Valley Water Co. of San Francisco, setting forth reasons for changing water rates and advantages of new system of charges. 1,200 words. Engineering and Contracting, Apr. 9. 15 cts.

Publicity in Water Waste Prevention Work. The news value of appeals in public press. 1 ill., 600 words. American City, April. 35 cts.

Office Methods:

Labor-Saving Method of Handling Water Consumers' Accounts. An ingenious system employed by the water department of Braddock, Pa.; "10-day final notice card." 2 ills., 400 words. Engineering and Contracting, Apr. 9. 15 cts.

Water Department Bookkeeping. A communication from the Punta Gorda department asking for information as to efficient method of handling water accounts is answered by Albert L. Sawyer, water registrar of Haverhill, Mass. 4 ills., 400 words. Fire and Water Engineering, Apr. 9. 15 cts.

Card Index of Valves. Engineering Department of Newton, Mass., maintained card index of water service pipes, showing measurements of gate valves, this method proving satisfactory, according to the city engineer. 300 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Water Charges in 51 Cities of 9,000 to 10,000 Population. Interesting information collected by Mr. Kenyon Riddle, of Xenia, O. 1 table, 200 words. Engineering and Contracting, Apr. 9. 15 cts.

Purification:

Chloramine and Crenothrix. Experiments to determine stability of chloramine solutions of different strengths; series of determinations of rate of decomposition of solutions; crenothrix troubles can be eliminated. By W. F. Monfort and O. A. Barnes. 2,000 words. Fire and Water Engineering, Apr. 23. 15 cts.

Chloramine and Crenothrix. Data concerning decrease in available chlorine of a chloramine solution, and rate of decomposition of chloramine solutions; action of chloramine on crenothrix. Paper before Illinois section, American Waterworks Ass'n, by W. F. Montfort and O. A. Barnes. 2,000 words. Canadian Engineer, Apr. 10. 15 cts.

Chloramine. Data concerning decrease in available chlorine of a chloramine solution, and rate of decomposition of chloramine solutions of different strengths. From a paper before the meeting of American Waterworks Ass'n, by W. F. Montfort and O. A. Barnes. 1,400 words. Engineering and Contracting, Apr. 9. 15 cts.

Regulating Chlorine Doses. Adjusting size of dose to character and condition of water treated; conclusions from experiments by Maryland Health Department; color and turbidity impracticable; five-minute absorption test recommended. 1,700 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

High Rate of Filtration Feasible for Detroit Water-Supply. Experiments warrant recommendation for rate of 175,000,000 gallons per acre; estimates for 300,000,000-gallon plant. 600 words. Engineering News-Record, Apr. 3. 20 cts.

Water Softening. Investigation; features of plant; and special problems of large installations. Abstract of paper before meeting of Ill, section of American Waterworks Ass'n. By M. F. Stein, civ. engr., Chicago. 5 ills., 2,700 words. Engineering and Contracting, Apr. 9. 15 cts.

The Lime Softening of Water and the Use of Sludge as an Aid. Description of the Grand Rapids mixing tank and typical experience with the changing seasons, illustrating the relations of time and temperature. By W. A. Sperry, chemist, filtration plant, Grand Rapids, Mich. 2,500 words. Engineering and Contracting, Apr. 9. 15 cts.

Lime Softening of Water and the Use of Sludge as an Aid. Typical experience at Grand Rapids mixing tank with the changing seasons, illustrating relations of time and temperature. By W. A. Sperry, chemist, filtration plant, Grand Rapids, Mich. 4,000 words. Canadian Engineer, Apr. 17. 15 cts.

Algae Cause Taste in Fort Worth Water. Special treatment necessary; aeration basin being built. By Rob. H. Craig, captain, sanitary corps, U. S. A., Camp Bowie, Tex. 600 words. Engineering News-Record, Apr. 17. 20 cts.

Differentia of B. Coli. Brief consideration of the two sub-groups of the B-Coli group which are most important to the water bacteriologist, namely, B. Coli Communis and B. Lactis Aerogenes. Paper before the Illinois section of the American Waterworks Ass'n, by Everett Judson, ass't sanitary engr., U. S. Public Health Service. 1,100 words. Canadian Engineer, Apr. 3. 15 cts.

Dundas Has New Filter Plant on Gravity Supply. Expenditure of only $30,000 provides progressive Ontario manufacturing town with modern filtration plant of 700,000 imperial gallons daily capacity; concrete dam forms conservation reservoir and provides ample head for the 1½-mile pipe line to filtration plant. By E. H. Darling, consulting engr., Hamilton, Ont. 6 ills., 2,200 words. Canadian Engineer, Apr. 17. 15 cts.

The Necessity of Filtration. Why cities and towns should filter their water; economic consideration apparently most difficult of comprehension; heavy typhoid list. By F. B. Leopold, gen. mgr., Pittsburgh Filter Mfg. Co. 800 words. Canadian Engineer, Apr. 24. 15 cts.

Dry Feeding of Chemicals Used in Water Purification. Description of new machine developed by the Pittsburgh Filter Manufacturing Co., which has been in use in the Toledo filtration plant for over 2½ years; plants in Great Falls, Mont., Flint, Mich., and other cities employing system of dry feeding. By F. B. Leopold, vice-pres., Pittsburgh Filter Mfg. Co. 1 ill., 1,500 words. Municipal and County Engineering, April. 25 cts.

Dams:

New Brunswick's New Dam. Concrete arch dam recently constructed in an existing reservoir without drawing water from the same. 700 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Panels of Movable Weir Collapse Automatically. Tripping started by float in chamber filled as flood rises; double skimming eliminates sediment from canals. 5 ills., 1,700 words. Engineering News-Record, Apr. 24. 20 cts.

Blanket Lake Bottom to Stop Leaks from Water Reservoir. Dike also built to cut off bay from which loss was heaviest; gage observations show plan successful. 600 words. Engineering News-Record, Apr. 10. 20 cts.

Temperature Effects on Concrete Reservoir. Newton, Mass., built extension to covered reservoir to which water was not admitted until after winter of 1917-18, the cold weather of which subjected the exposed concrete to unanticipated temperature changes. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Move Equipment and Material for Dam Through Small Tunnel. In building dam everything had to go through 42x48-inch section of Santa Barbara water conduit then in service. 2 ills., 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Miscellaneous:

San Francisco's High-Pressure Water Supply. Recognized as one of the most powerful and efficient for fire protection ever constructed; safeguards with which system is protected from damage by earthquake or accident. 6 ills., 3,400 words. Engineering World, Apr. 15. 15 cts.

Water Supply at U. S. Government Camps and Cantonments. Accomplishments of the Construction Division of the War Department enumerated by Lieut.-Col. Dabney H. Maury, U.S.A., advisory engr. on water supply, at a meeting of local branch of Am. Society of Civil Engineers, New York. 1,600 words. Engineering World, Apr. 15.

New Soft Water Supply for Greater Winnipeg is put into service. General chorus of approval for new supply which contains only about 40 parts of hardness per million as compared to 500 parts contained in the previous artesian supply; brings water 95 miles. By W. G. Chace, chief engr., Greater Winnipeg Water Dist. 2 ills., 1,200 words. Canadian Engineer, Apr. 24; 15 cts.

Methods of Drilling and Test Results of Large Capacity Well. Interesting information regarding one of six wells that furnish the water supply of the University of Illinois. Abstract of paper before meeting of Ill. section of American Waterworks Ass'n, by M. L. Enger, Prof. of Mechanics and Hydraulics, University of Illinois. 3 ills., 1,200 words. Engineering and Contracting, Apr. 9. 15 cts.

Air-Lift Artesian Well. Supply of water for Clinton, Ia., is secured from some half dozen wells having a surface flow of limited volume; handled by means of air-lift pump. By John Oliphant, chief engr. of pneumatic pumping department, Sullivan Machinery Co., 1 ill., 500 words. Municipal Journal and Public Works, Apr. 5. 10 cts. Engineering and Contracting, Apr. 9. 15 cts.

Action of Certain Waters on Metals. The properties of certain western waters with reference to their effect on water and steam pipes; Champaign-Urbana water supply first of its kind to come under notice. By S. W. Parr, prof. applied chemistry, University of Illinois, Urbana. 1,000 words. Fire and Water Engineering, Apr. 2. 15 cts.

Causes and Prevention of Corrosion of Pipe Carrying Hot Water. By a process of "deactivation" even water which has considerable acidity may be rendered nearly non-corrosive. 400 words. Electric Railway Journal, Apr. 19. 15 cts.

Municipal Work in Detroit. Successful work in trench digging and pipe laying by the water department of the city; performs economically its own work in maintenance, repair and new construction; made possible by use of labor-saving machinery. 3 ills., 1,300 words. Fire and Water Engineering, Apr. 30. 15 cts.

The Freezing of a Reservoir Outlet Works. Two means of prevention suggested: Reducing rate of flow by drawing from each reservoir separately, or early formation of sheet of surface ice over water in the immediate vicinity of shaft. By Gilbert Christie, engr. and mgr., Irvine and District water board, from Transaction of Institution of Water Engrs. 1 ill., 1,100 words. Engineering and Contracting, Apr. 30. 15 cts.

Rainfall Records. Variation in rainfall rates of different areas; mass diagrams; evaporation and run-off. From paper before meeting of New England Waterworks Ass'n, by L. M. Hastings, city engr., Cambridge, Mass. 2,000 words. Canadian Engineer, Apr. 3. 15 cts.

American Waterworks Association. Officers nominated for coming association year; convention at Buffalo, N. Y., June 1 to 13, 1919; advance program and rules for exhibits. 6 ills., 1,500 words. Fire and Water Engineering, Apr. 9. 15 cts.

LIGHTING AND POWER.

Street Lighting:

Street Lights in Columbus. During 1918 the municipal electric light plant of Columbus, O., replaced the old-style carbon arc lamps on street lighting circuits by 400 c. p. gas-filled lamps; Lewis Rowe, acting superintendent, reports saving of one-half in current and labor, with 25% more light. 600 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Simple Lamp-Record System for Street Lighting Circuits. Card records are easily maintained to show type and history of lamps in use on large systems for street, boulevard or park lighting operated on definite schedules. By T. D. McDowell, electrical foreman, South Park System, Chicago. 3 ill., 1,000 words. Electrical Review, Apr. 26. 30 cts.

Hydro-Electric Plants:

Water Economy in Hydroelectric Plants. Intelligent conservation of excess water may save coal in the operation of combined hydroelectric and steam plants; in some cases the power factor of the hydro-generator may be raised in order to utilize available water. By L. W. Wyss, Peninsular Power Co., Iron Mountain, Mich. 1 ill., 2,000 words. Electrical World, Apr. 12. 15 cts.

The 10,000 H. P. Hydro Electric Plant at Bombay. As rain falls only during 3 or 4 months, it was necessary to store water sufficient to give 100,000 h. p. for 10 or 12 hours a day during 9 months of year; lakes formed by 4 masonry dams. By Rob. B. Joyner, from paper before Institution of C. E. 800 words. Engineering and Contracting, Apr. 30. 15 cts.

Installation, Care and Maintenance of Water Wheels. Proof of water wheels is its operation; must have straight shaft. By D. W. Rounds, S. Morgan Smith Co., York, Pa. 1,000 words. Canadian Engineer, Apr. 24. 15 cts.

Construction Methods Used at Drummondsville. In damming the St. Francis river and building power house to develop about 19,000 h. p.; 2,900 feet of cofferdams required for 1,890-foot dam; concrete distributed over long distances in V-shaped, steel cars during winter. By James Dick, 7 ills., 2,800 words. Canadian Engineer, Apr. 24. 15 cts.

Interconnection Reduces Steam Reserve Necessary. Benefits which have been realized by tying together power systems in Central California; improvement of diversity factor and pooling of water power resources have proved of great advantage. By L. J. Moore, electrical engr., San Joaquin Light and Power Corporation. 4 ills., 2,000 words. Electrical World, Apr. 26. 15 cts.

Steam Plants:

Methods for Reducing Coal Consumption: 20 "Dont's" for Firemen and Water Tenders. Useful suggestions on conservation of coal based on experiences at the power plants of the Union Traction Co. of Indiana, given by G. H. Kelsey, electrical engr. of the company, in "Safety," the company's magazine. 1,600 words. Engineering and Contracting, Apr. 9. 15 cts.

Chemical and Physical Control of Boiler Operation. Abstract of A.S.M.E. paper; included is the application of simple formulas for estimating heat loss items, etc. By E. A. Uehling, pres., Uehling Instrument Co. 1 ill., 7,000 words. Electrical Review, Apr. 19. 30 cts.

Education of Boiler Room Men Necessary for Fuel Conservation. Experiences of several large companies in fuel conservation at their plants summarized by Edgar A. Hunger in Electrical World. 2,000 words. Engineering and Contracting, Apr. 9. 15 cts.

An Effective Yet Simple Bonus System for Power Plants. Result of a bonus system employed by the management of the Manila electric railway and devised by the writer, B. H. Blaisdell, chief engr. of the company's power plant, that has given most satisfactory results. 1 ill., 2,500 words. Engineering and Contracting, Apr. 9. 15 cts.

Scraping of Boiler Tubes in the Boiler Setting. A casting with openings in front or rear wall of a boiler setting gives access for scraping off cinder deposit from tubes. 1 ill., 500 words. Electric Railway Journal, Apr. 19. 15 cts.

Miscellaneous:

Constructs Largest Gas Line in the United States. Coke plant builds gas main 40 inches in diameter laid near Pittsburgh; method of construction and joints described. 5 ills., 1,400 words. Engineering News-Record, Apr. 10. 20 cts.

Economic Use of Static Condensers. Problems of power-factor correction by static condensers are analyzed for purposes of improving voltage regulation and reducing copper losses; when and to what extent it pays to install condensers. By Waldo V. Lyon, ass't professor of electrical engrg., Mass. Institute of Technology. 4 ills., 3,500 words. Electrical World, Apr. 12. 15 cts.

Economic Use of Static Condensers. Solution of problem of increasing capacity of a generating plant by using static condensers to correct power factor; determination of feasibility of putting less generating equipment in new plant by using condensers. By Waldo V. Lyon, ass't professor of electrical engrg., Mass. Institute of Technology. 2 ills., 2,300 words. Electrical World, Apr. 19. 15 cts.

Effect of Prohibition on Lighting Revenue. Analysis of experience of companies in communities already dry indicate what may be expected to happen after July 1 in those places where liquor is now sold. 2 tables, 2,500 words. Electrical World, Apr. 12. 15 cts.

Lubrication of Electric Generators and Motors. Importance of lubrication; influence of type of apparatus upon choice of lubricant; characteristics of different lubricants; choice of lubricant for specific purposes. By Reginald Trautschold, Swan & Finch Co. 2,000 words. Electrical Review, Apr. 19. 30 cts.

Bureau of Standards Studies Return Circuit Conditions in Milwaukee. Report recently completed is the first prepared at the request of a public service commission. By E. R. Shepard, electrical engr., Bureau of Standards. 4 ills., 2,500 words. Electric Railway Journal, Apr. 19. 15 cts.

The Electrical Installation in San Francisco's City Hall. Extensive conduit and wiring system for light, power, communication and signaling; some of the special features. 7 ills., 7,000 words. Electrical Review, Apr. 26. 30 cts.

Combined Central-Station Report for United States. Census Bureau's summary of state reports shows decided increases in industry throughout country. 700 words. Electrical Review, Apr. 5. 30 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Refuse Collection:

Planning Refuse Collection. Editorial comment on article in this issue with general suggestions for planning system of refuse collection. 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Scavenging Unsewered Districts. Editorial discussion of sanitary pail system, with strictly regulated collection and disposal, for small communities which are unsewered. 150 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Efficiency in City Scavenging. Introducing more effective and economical methods into the removal of night soil in a southern city; general suggestions for planning a system of refuse collection. 3 ills., 2,800 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Refuse Disposal:

Dumping Refuse at Oakland. City continuing this method, having covered over five acres, which has settled to such an extent that it is not more than three or four feet above high water. 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

The Army's Utilization of Camp Wastes. Change of army practice from incineration to utilization not detrimental to health and netted Government $2,-

000,000 a year; first utilization contracts; present contracts reduce waste of food. By F. C. Bamman, consulting engr., Washington, D. C. 2 ills., 4,500 words. Municipal Journal and Public Works, Apr. 26. 10 cts. (To be concluded.)

Construction and Operation of the New Refuse Destructor in Brookline, Mass. Must be maintained to the satisfaction of Board of Health; house holder required to separate refuse into three classes. 3 ills. By H. A. Varney, town engr. 3 ills., 900 words. American City, April. 35 cts.

Refuse Disposal in London. How St. Marylebone screened its refuse, recovered paper and other salable materials, and used a clay pit for dumping. 1,500 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Street Cleaning:

Efficient Methods of Snow Removal from Highways Outside of Urban Districts. Conditions to be considered are the geographical location of section and local conditions. Committee report before the American Road Builders' Ass'n. 1,700 words. Good Roads, Apr. 26. 10 cts.

Notices Painted on Sidewalk. Mayor King, of Bristol, Tenn., has adopted novel method for calling public's attention to ordinances for keeping streets clean. 100 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

FIRE DEPARTMENT.

A Fire Station Staged. Novel scene by the fire department of Portland, Ore., in a safety bureau exhibition; complete fire house, with apparatus, equipment and firemen; other interesting features shown in fire prevention exhibit. By Fred R. Waters. 500 words. Fire and Water Engineering, Apr. 9. 15 cts.

Fire Escapes. Ideal conditions and actual very different; not always possible to alter old buildings to accommodate new ideas. By Marshall H. W. Bringhurst, Seattle, Wash. 2,400 words. Fire and Water Engineering, Apr. 23. 15 cts.

New York and Two Platoons. A consideration of the relative advantages of the single and double platoon systems from the standpoint of the big city's best service; advantage of a contented personnel under two-platoon emphasized. By C. E. Meek, N. Y. C., asso. mem. I. A. F. E. 1,000 words. Fire and Water Engineering, Apr. 30. 15 cts.

Pyromania. An insane disposition to incendiarism; disease prevails to an alarming extent; some remarkable case cited; a remedy in education of the young in schools. By Ole O. Foe, state marshal of Iowa, from paper before joint meeting of State Fire Marshals' Ass'n and Nat. Board of Fire Underwriters, N. Y. C. 2,200 words. Fire and Water Engineering, Apr. 9. 15 cts.

TRAFFIC AND TRANSPORTATION.

Long-Distance Motor-Truck Haulage Costs in Ohio. Routes between Akron, Youngstown and Cleveland investigated; present rates too low; operate for 52 cents per truck mile. 1,200 words. Engineering News-Record, Apr. 10. 20 cts.

Motor Truck Haulage for Farmers. Suggestions based on the operations of a Farmers' Co-operative Company in Hartford county, Maryland. 1 ill., 1,200 words. Good Roads, Apr. 12. 10 cts.

The New York and New Jersey Vehicular Tunnel. Reasons for constructing it and merits of various types of tunnel proposed. 6 ills., 3,300 words. By Edward A. Byrne, chief engr., Dept. of Plants and Structures, N. Y. C. Engineering World, Apr. 15. 15 cts.

What Shall We Do with the Street Railways? Service at cost a step toward public operation; public regulation as difficult as public operation; capital value the primary problem. By Delos F. Wilcox. 2,400 words. American City, April. 35 cts.

STRUCTURES AND MATERIALS.

Cement and Concrete:

Solubility of Portland Cement. And its relation to theories of hydration. By J. C. Witt and F. D. Reyes, of the Laboratory of General, Inorganic and Physical Chemistry, Bureau of Science, Manila, P. I. 3,400 words. Engineering World, Apr. 1. 15 cts.

Has the Los Angeles Municipal Cement Plant Been an Economic Success? Ten years ago a plant costing $890,000 was put into operation and is now to be sold, $450,000 being the minimum bid considered. 1,000 words. Engineering and Contracting, Apr. 2. 15 cts.

Depositing Concrete Under Water. Data which the Masonry Committee of the American Railway Engineering Association believes it is desirable to present as representing the best practices to be followed. 2,400 words. Engineering World, Apr. 1. 15 cts.

How to Design Concrete Mixtures. Proper proportions can be determined for different kinds of material; new theories regarding aggregate grading advanced by D. A. Abrams as result of tests. 7 ills., 4,500 words. Engineering News-Record, Apr. 17. 20 cts.

Bridges.

Highway Bridges and Heavy Trucks. Necessity of frequent inspection by competent men; how weak bridges can be strengthened. Report to the American Road Builders' Ass'n by its committee, of which Willis Whited is chairman. 2,400 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

Are Our Highway Bridges Safe? County highway officials say one-third of all bridges are unsafe for heavy trucks; a state authority says 80%; defective bridges more serious than defective roadways. 9 ills., 2,500 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

But How About the Bridges? Editorial comment on the inconsistency of limiting trucks to maximum weights which many of the bridges cannot carry with safety. 150 words. Municipal Journal and Public Works, Apr. 19. 10 cts.

British Joint Committee Report on Loads on Highway Bridges. Classification of the bridges reduced to three classes; effect of speed; tires and wheel diameters. From The Surveyor, Mar. 7. 1,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Standard Bridge Abutments on Canal Projects. Two types of abutments, reinforced concrete and timber pile, are used on Rio Grande irrigation development. By D. C. Willett, El Paso, Tex. 2 ills., 300 words. Engineering News-Record, Apr. 17. 20 cts.

Timber Arch Bridge One Hundred Feet in Length. Forces of Fulton Coal Co. design and build structure; Luten formula for a concrete arch ring used. By D. R. Walkinshaw, Greensburg, Pa. 2 ills., 400 words. Engineering News-Record, Apr. 17. 20 cts.

New Type of Expansion Joint Devised for Concrete Girders. Consists of trough-shaped steel plate sliding on bedplate. 1 ill., 300 words. Engineering News-Record, Apr. 17. 20 cts.

Highway Bridge Piles Concreted to Avoid Replacing. Work accomplished without interruption of traffic when piles had been practically destroyed by teredos. By F. E. Semon, city engr., Port Angeles, Wash. 2 ills., 700 words. Engineering News-Record, Apr. 17. 20 cts.

Canada's Longest Reinforced Concrete Trusses. The 2 bridges that carry the Toronto-Hamilton highway across the Etobicoke river and Bronte creek; each 119 ft. 1½ in. clear span, with 20 ft. roadway and 16 ft. overhead clearance; arches rise 26 ft. above floor level. 15 ills., 2,000 words. Canadian Engineer, Apr. 3. 15 cts.

Maintenance and Painting of Highway Bridges. Classification of structures according to conditions; strengthening and repairing old bridges; bridge floors. Abstracted from address before the Road School, University of Kentucky, by Chas. D. Snead, bridge engr., state dept. of public roads, Ky. 1,300 words. Canadian Engineer, Apr. 3. 15 cts.

New Bridge Across Lake Boundary of Worcester, Mass. Consists of six arches and a viaduct, and is constructed of reinforced concrete. By Philip H. Holbrook. 1 ill., 500 words. American City, April. 35 cts.

Progress Report of the Committee on Methods of Strengthening and Reconstructing Highway Bridges for Heavy Truck Traffic. Presented at the convention of the American Road Builders' Ass'n. 2,500 words. Good Roads, Apr. 5. 10 cts.

Reinforced Concrete Lift-Span Towers for High Bridge. Economic studies for bridge over the Osage river in Missouri showed that reinforced concrete towers were cheaper and more desirable than structural steel. By F. H. Frankland, consulting engr., N. Y. C. 1 ill., 700 words. Engineering News-Record, Apr. 3. 20 cts.

Miscellaneous:

Relieving Arches in Subway Distribute Stress to Piers. Engineer's special design meets difficult loading conditions imposed by architect's design; groined arches used in street subway under a park. 5 ills., 1,700 words. Engineering News-Record, Apr. 3. 20 cts.

Sewer Complicates Foundation Plans. Armory building has concrete columns seated on girders spanning sewer; basement floor is carried by girders. 2 ills., 500 words. Engineering News-Record, Apr. 17. 20 cts.

Notes on the Design of a Single-Wall Cofferdam. Size and location of timber walls and braces and size of timber and steel sheeting developed from both theoretic and economic considerations. By F. R. Sweeny, engr., Foundation Co., Pittsburgh, Pa. 3 ills., 2,500 words. Engineering News-Record, Apr. 10. 20 cts.

New Municipal Pier in Philadelphia. Progressive construction advances city's standing as a seaport. 500 words. American City, April. 35 cts.

Concrete Pile Trestle Construction. Economy lies in the fact that the piles and slabs can be cast in a central yard where supplies of sand and gravel are easily obtained; pile trestles cost only about 80% as much as earlier type with solid piers. By Albert M. Wolf. 6 ills., 1,700 words. Engineering World, Apr. 15. 15 cts.

The Francois and Portier Grouting Processes. Injection should be done under considerable pressure; condition most suitable for hard setting in the shortest time, when the cement is pumped under pressure into fissures. By A. H. Krynauw, from Transactions Chemical, Metallurgical and Mining Society. 1,100 words. Engineering and Contracting, Apr. 30. 15 cts.

Solving Construction Problems in Canal Street Subway. High ground-water level complicated deep construction work under old subway in New York City; pit and drift methods used. By A. J. Mayell, ass't division engr., Public Service Comn., N. Y. C. 4 ills., 2,300 words. Engineering News-Record, Apr. 3. 20 cts.

Philadelphia City Hall Subway Station. Construction of the new subway under the Philadelphia city hall is interesting to engineers and contractors on account of its numerous features; work was of so much importance that it was not halted during the war. By Harry Gardner. 12 ills., 4,000 words. Engineering World, Apr. 1. 15 cts.

Record Height Concrete Multiple-Arch Dam Completed. Dam forming Lake Hodges in irrigation district near San Diego is 136 feet from crest to low point in valley. 4 ills., 900 words. Engineering News-Record, Apr. 10. 20 cts.

MISCELLANEOUS.

Town Planning Includes "Sunlight Engineering." Streets should generally run northeast-southwest or northwest-southeast instead of being square with the cardinal points; main streets built up with skyscrapers should be north-south if building heights cannot be limited. By H. L. Seymour, engrg. ass't to the Domion housing and town planning adviser. 2 ills., 4,500 words. Canadian Engineer, Apr. 10. 15 cts.

The Chicago Railway Terminals. The cooperative principle; application of a solution of the terminal problem; river straightening; passenger stations. By E. J. Noonan, chief engr., Chicago Ry. Terminal Commission. 4 ills., 5,500 words. Engineering World, Apr. 1. 15 cts.

An Interallied Architectural Competition: A Model City to Be Built. City of Chauny on the Aisne has opened an interallied competition for improving arrangement and extension of city and its suburbs under most modern conditions. By Preston Hersey. 600 words. American City, April. 35 cts.

Housing Schemes. Methods already worked out; how they would affect Canada; New Zealand methods. By J. W. MacMillan. 1,500 words. Canadian Municipal Journal, April. 20 cts.

The U. S. Homes Registration Service as a Civic Asset. Present need of homes; good housing a community affair. By Edward L. Schaub, chief, section of Homes Restoration Service, U. S. Housing Corporation. 1,800 words. American City, April. 35 cts.

The Canadian Government Housing Loan. The four conditions attached to the federal loan. By Thos. Adams, town

(*Continued on page* 348)

NEWS OF THE SOCIETIES

May 13-14—AMERICAN ASSOCIATION OF ENGINEERS. Annual meeting, Chicago, Ill. Secretary, C. E. Drayer, 29 South LaSalle St., Chicago, Ill.

May 14-15.—LEAGUE OF TEXAS MUNICIPALITIES. Seventh annual convention, Sweetwater, Tex. Secretary-treasurer, Frank M. Stewart, University of Texas, Austin, Tex.

May 19-24.—NATIONAL ELECTRIC LIGHT ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, T. C. Martin, 29 W. 39th St., New York.

June 9-13.—AMERICAN WATER WORKS ASSOCIATION. Thirty-ninth annual convention, Iroquois Hotel, Buffalo, N. Y. Secretary, J. M. Diven, 47 State street, Troy, N. Y.

June 17-20.—AMERICAN SOCIETY OF CIVIL ENGINEERS. Annual meeting, St. Paul-Minneapolis. Secretary, Charles W. Hunt, 33 W. 39th St., New York, N. Y.

June 23-26. — SOUTHWESTERN WATER WORKS ASSOCIATION. Annual convention, Coates House, Kansas City, Mo. Secretary, E. L. Fulkerson, 617 Washington St., Waco, Tex.

June 24-27. — AMERICAN SOCIETY FOR TESTING MATERIALS. Twenty-second annual meeting, Hotel Traymore, Atlantic City, N. J. Secretary, University of Pennsylvania.

June 24-27.—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Annual convention, Kansas City, Mo. Secretary, Gen. Fire Marshal James McFall, Emergency Fleet Corporation, U. S. Shipping Board, Philadelphia, Pa.

Nov. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, New Orleans, La. Secretary, Charles C. Brown, Springfield, Ill.

National Highway Traffic Association.

The annual meeting of the National Highway Traffic Association will be held at the Automobile Club of America, 247 West 54th street, New York City, on Wednesday, May 14, 1919.

The afternoon session will be devoted to a joint conference of the Reconstruction Commission of the State of New York and the association. The following addresses will be made:

"Development of Rural Motor Express Throughout the United States," by F. W. Fenn, secretary, Motor Truck Committee, National Automobile Chamber of Commerce.

"Transportation Surveys for Rural Motor Express Routes," by J. H. Collins, member, Highways Transport Committee, Council of National Defense, and investigator of market surveys, United States Department of Agriculture.

"Wanted: Rural Motor Express in the State of New York," by James E. Boyle, extension professor of rural economy, Cornell University.

"Sign Posting for Through Routes in Municipalities and Detours During Highway Construction," by Elmer Thompson, secretary of the Automobile Club of America.

At the business session will be received the annual reports of the secretary, Elmer Thompson, and treasurer, George H. Pride, and of the executive committee, by Elmer Thompson. The committee on "Pavement Openings and Restorations," B. H. Wait, chairman, W. G. Chollar, and J. B. Vandever, will report. The nominating committee will submit its report and the election of officers for 1919-1920 will be held.

An informal dinner, at $1.50 per cover, will be served in the grill room of the club at 6.30 p. m.

The evening session, at 8 p. m., will open with the presidential address, "Highway Transport Engineering" (illustrated), by Arthur H. Blanchard. Then will follow:

"The Townsend Highway Bill and the Work of the Federal Highway Council," by H. G. Shirley, secretary, Federal Highway Council.

"Highway Requirements for Twentieth Century Transportation," by W. G. Thompson, state highway engineer of New Jersey.

"The Control of Traffic on Feeder Highways," by Edward J. Mehren, editor, Engineering News-Record; George H. Pride, president, Heavy Haulage Company; and George M. Graham, manager, Pierce-Arrow Motor Car Company.

"The Open Road to a Greater America," by the Educational Department of the Universal Film Manufacturing Company—first production of a motion picture created to show the high cost of bad roads and the advantages of motor transport.

The public, including ladies, is cordially invited to attend the dinner and the several sessions. The secretary, Elmer Thompson, 247 West 54th street, New York City.

The American Association of Engineers.

The American Association of Engineers received 123 applications for membership in one day, April 18. Secretary C. E. Drayer of the Association wishes to know if this is not the best day's record of any national society of engineers.

The secretary announces that the proceedings of the Chicago Conference of March 17, and the hearing at Washington, March 31, are now ready for distribution and that a copy will be sent to any engineer who makes request of the association headquarters, 29 S. LaSalle St., Chicago.

The staff at national headquarters had been strengthened by the addition of Mr. D. A. Tomlinson as assistant secretary. He has charge of the railroad work and will aid in the service department of the association by reason of experience gained while central zone manager of the Special and Professional Section of the U. S. Employment Service. Mr. Tomlinson was formerly with the Western Society of Engineers several years ago.

The Chicago Chapter of the association has selected as manager L. J. Burke. Mr. Burke has been engaged in railroad work and has recently received his discharge from the Army, in which he was a Captain.

The following were recently elected officers of the Cincinnati Chapter of the association: President, E. K. Ruth, asst. professor, dept. of civil engineering, University of Cincinnati; vice-president, G. E. Halstead, 2147 St. James ave., Walnut Hills; secretary, L. P. Kimball, Engineer of Bldgs., B. & O. R. R., Cincinnati; treasurer, C. S. Carrol, college of civil engineering, University of Cincinnati.

At Portland, Ore., a chapter of the association is in process of formation. Officers are: President, W. H. Marsh, prin. asst. engr., Spokane & Seattle Ry. Co.; secretary-treasurer, R. W. Barnes, prin. asst. engr. Southern Pacific Co.

Alabama Municipal League.

An organizing convention of mayors and other city officials of Alabama was recently held at the Tutwiler hotel, Birmingham. A number of important municipal subjects, especially the financing of public improvements were considered.

George E. Crawford, mayor of Mobile, was elected to head the league. Other officers were mayor Jones of Bessemer, five vice-president; C. A. Whitmeyer, of Jacksonville, second vice-president; L. Bemish, of Selma, third vice-president; H. S. Ryall, of Birmingham, secretary-treasurer. An executive committee was named consisting of W. E. Stripling, of Florence; Dr. N. A. Barnett, of the city commission of Birmingham; W. C. Glenn, of Enterprise; D. P. Coleman, of Uniontown, and H. S. Chase, of Huntsville.

The league adopted a constitution and by-laws and adjourned to meet next in Montgomery on May 28.

American Institute of Electrical Engineers.

The annual business meeting of the American Institute of Electrical Engineers will be held Friday, May 16, 8:30 p. m., in the auditorium of the Engineering Societies building, New York. At this meeting, the board of directors will report and the new officers elected announced.

The Weaver memorial tablet, which is to be erected in the headquarters of the institute "in acknowledgment of the services rendered to the institute and to the electrical engineering profession by William D. Weaver," will be exhibited.

The Edison medal will then be formally presented to Benjamin G. Lamme for his inventions and services in the development of electrical machinery. Mr. Lamme holds about 140 patents, many of fundamental importance in the present methods of generating, transmitting and using electrical power. Since 1889 he has been connected with the Westinghouse Electric and Manufacturing Co. He is widely known among electrical en-

gineers, both in Europe and America. In 1915, upon nomination by the institute, he was appointed a member of the Naval Consulting Board.

INDUSTRIAL NEWS

Blasting Concrete With Explosives. **E. I. du Pont de Nemours & Co.,** Wilmington, Del., has issued a pamphlet entitled "Blasting Concrete With Du Pont Explosives," by S. R. Russell, C. E. It should prove useful to contractors and public works officials who are confronted with the problem of quickly and economically removing old concrete, such as machinery foundations, old walls, old bridge abutments or piers. Practical directions are given, with helpful details.

The American-La France Fire Engine Co., Inc., Elmira, N. Y., announces the shipment of the following equipment: Watertown, N. Y., type 12 combination; New York, N. Y., gasoline propelled motor cars (3); Atlantic City, N. J., type 31 tractor; New York, N. Y., gasoline propelled motor cars (2), Arlington, N. J., type 12 triple combination pumping engine, chemical engine hose car; Jersey City, N. J., type 12 triple combination (2); Yokohama, Japan, two type 40 pump and hose cars; West Chester, Pa., type 12 combination; Port Huron, Mich., type 12 combination; Hudson, N. Y., type 14 service truck; Idaho Falls, Idaho, type 17 tractor; Mitchell, S. Dak., type 12 triple; Osage, Iowa, type 40 combination with Jr. pump; Eau Claire, Wis., type 12 triple; Littlestown, Pa., type 40 combination with Junior pump; Tacoma, Wash., two type 12 triples, two pumping engines and hose cars.

The Philadelphia Vitrified Brick Co., Philadelphia, Pa., has engaged in the manufacture of wire-cut lug paving brick under license contract with The Dunn Wire-Cut Lug Brick Co., of Conneaut, O. The eastern works of the company are at Saxton, Pa. Charles D. Ames is president of the company and J. T. Hawthorne is secretary and treasurer. The addition of the plant of the Philadelphia Vitrified Brick Co. makes 75 plants licensed to make wire-cut lug brick in twelve states.

Equipment Layout on Road Work. A useful collection of "blue prints" has been issued by the **Koehring Machine Co.,** Milwaukee, Wis., which should prove helpful to highway construction officials and contractors on concrete highway work. The title is "Blue Print Suggestions on Haulage, Loading Stations and Mixer Equipment for Road Work." With the possibilities of bigger construction units, the problems of hauling, loading and mixing become important and this booklet presents suggestions upon which efficient methods can be based. Various types of problems are studied and diagrams presented showing solutions which should prove effective. Those who have concrete roads to build this season should get a copy of these blueprints.

MUNICIPAL INDEX

planning advisor, Canadian Comn. of Conservation. 800 words. American City, April. 35 cts.

Community Heating of Dwellings. Economy, cleanliness and convenience of central station heating as compared with house furnaces; heating as the prime object and electric current as the by-product. 4,500 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

Columbus Board of Purchase. Considerable sums saved by knowledge of all department needs and of market fluctuations, personal bargaining, and standardization of supplies. 900 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

Oakland Municipal Garage and Shop. 53 cars regularly maintained and others repaired occasionally; maximum economy and efficiency aimed at; purchasing and handling materials; records of materials, operations and performances; new equipment constructed. By C. W. Geiger. 3 ills., 3,300 words. Municipal Journal and Public Works, Apr. 12. 10 cts.

Municipal Photograph and Blue Print Plant. Operated by San Francisco for doing all the work required by all departments of city government; electric blue print machine; photostat machine. 2 ills., 300 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

A Uniform System of Accounting for Cities of the Third Class in New York. Under immediate charge of a bureau the operations of which are not directly related to the affairs of the state, but rather to those of its political subdivisions. By Eugene M. Travis, state comptroller, Albany, N. Y. 1,000 words. American City, April. 35 cts.

Free Public Utilities. Indication that trial may be made before long in this country of public utilities of various kinds operated at expense of taxpayers for free use of all citizens. 400 words. Municipal Journal and Public Works, Apr. 5. 10 cts.

How Should a Federal Department of Public Works Be Organized? Need for clear determination of what bureaus should be included, and how personnel should be protected and built up. By Chas. W. Baker, consulting engr. 2,800 words. Engineering News-Record, Apr. 10. 20 cts.

The Port of Seattle. Has more mechanical handling equipment than any other port in the U. S. with exception of New Orleans. 3 ills., 2,500 words. By G. F. Nicholson, chief engr. Engineering World, Apr. 15. 15 cts.

Field Methods on Rapid Stadia Surveys at Columbus. All lines by stadia, levels taken with transit; special rod extension; colored cloths and whistles for signals. By H. K. Kistler, instructor in civil engrg., Pennsylvania State College. 2 ills., 600 words. Engineering News-Record, Apr. 17. 20 cts.

How Educational Reconstruction Should Develop. Modern American engineering education must become more effectively concrete in application of theory to practice. By L. W. W. Morrow, ass't professor of electrical engrg., Sheffield Scientific School, Yale University. 3,500 words. Engineering News-Record, Apr. 24. 20 cts.

Education and Training of Municipal and County Engineers. Giving opinions of various engineers at a discussion at special meeting of Institution of Municipal and County Engrs., from The Surveyor. 2,000 words. Engineering and Contracting, Apr. 30. 15 cts.

Lessons from Professional Organization in England. Editorial discussion referring to abstract in this issue of the report by Sidney and Beatrice Webb; conditions bear striking similarity to those in this country. 1,500 words. Engineering News-Record, Apr. 10. 20 cts.

Obtaining Proper Recognition of the Engineering Profession. Three prime requisites are organization, licensing and broader education, interest and activity in other than purely technical matters. Excerpts from address by W. W. K. Sparrow, chief engr., Chicago, Milwaukee & St. Paul Railroad Co., Chicago. 2,200 words. Municipal and County Engineering, April. 25 cts.

Professional Organization in England. Abstract of an analysis by Sidney and Beatrice Webb of the motives, methods and results of such organization, including that of engineers. 6,000 words. Engineering News-Record, Apr. 10. 20 cts.

Prices Yesterday, Today and Tomorrow. An analysis of the factors; scarcity, demand, advance in wages and inflation; responsible for the present high price level. Paper by O. P. Austin, statistician of the Nat. City Bank, N. Y. C., before Editorial Conference of N. Y. Business Publishers' Ass'n. 4,000 words. Engineering News-Record, Apr. 24. 20 cts.

High Price Level a Future Probability. Discussion on the new price revolution, which was read before the conference of governors and mayors at Washington by Irving Fisher, professor of political economy of Yale University. 1 ill., 3,100 words. Gas Age, Apr. 1. 25 cts.

An Analysis of Present Market Conditions. Reconstruction, costs of materials, supply and demand; examples of activity; greatly reduced costs improbable. From a paper before conference of American Gas Ass'n by Edmund S. Dickey, Baltimore, Md. 5,600 words. Gas Age, Apr. 1. 25 cts.

How Shall the Labor of the Country Be Restored to a Normal Basis? Ideas presented at the recent conference of governors and mayors at the White House. Bringing Unused Land Into Service, by Hon. Franklin K. Lane, Secy. of the Interior. Deportation of Aliens, by Hon. W. B. Wilson, Secy. of Labor. Means of Restoring Industrial Activity, by Hon. James M. Cox, Governor of Ohio. "Buy Wisely but Buy Now," by R. W. Babson, Dept. of Labor. A Home-Building Campaign Essential, by Ernest T. Trigg. "We Stand in Need of Good Roads," by S. M. Williams, pres., Highways Industries Ass'n. 1 ill., 3,600 words. American City, April. 35 cts.

City and County Engineers Report Public Works Activity in All Parts of the Country. Letters from city and county engineers reflect optimism of local authorities and report specific plans and progress. 4,200 words. Municipal and County Engineering, April. 25 cts.

Public Works Booming. Best contractors will soon be loaded up with work; those wishing to let work to such or to obtain efficient foremen or mechanics will need to act promptly. 250 words. Municipal Journal and Public Works, Apr. 26. 10 cts.

The Sioux Falls Spillway for Flood Relief of the Big Sioux River, South Dakota. The original spillway; new spillway designed to absorb energy of water; method of making hydraulic excavation; protecting concrete against erosion. By F. C. Shenehon, Mem. Am. Soc. C. E., 628 Metropolitan Bank Bldg., Minneapolis, Minn. 6 ills., 2,500 words. Municipal and County Engineering, April. 25 cts.

Flood Control Work in Washington. Description of what has been accomplished in the Inter-county River Improvement project, undertaken about 5 years ago. By W. A. Scott. 12 ills., 4,800 words. Engineering World, Apr. 1. 15 cts.

New Methods for the Solution of Backwater Problems. Use of diagrams with only one major variable reduces computations and leads to more accurate results. By H. R. Leach, Saginaw, Mich. 6 ills., 2,300 words. Engineering News-Record, Apr. 17. 20 cts.

Cost of Ditches for Reclaiming Idaho Lands. Cultivated ground spoiled by excess irrigation water is restored by drainage; caterpillar electrically-driven excavators used. By D. W. Cole, formerly project mgr., Boise Irrigation Project, U. S. Reclamation Service, Boise, Idaho. 1,000 words. Engineering News-Record, Apr. 3. 20 cts.

Inclined Railway to Deliver Materials on Hetch Hetchy Project. 1,700-foot incline to early intake portal. 1 ill., 400 words. Engineering News-Record, Apr. 10. 20 cts.

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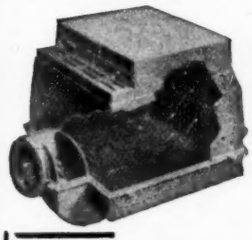

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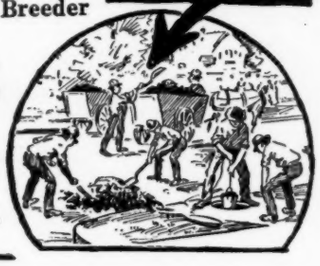

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Main Office:
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CHICAGO OFFICE: 11 South La Salle Street

Canadian Representatives:
General Supply Company of Canada, Ltd.
Ottawa Toronto Montreal Winnipeg Vancouver

Liquid EBG Chlorine